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THE JOURNAL

OF

The Department of Agriculture.

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NHILL FARM COMPETITION, 1907.

F. E. Lee, Agricultural Superintendent.

REPORT TO THE SECRETARY, NHILL AGRICULTURAL SOCIETY.

I have much pleasure in forwarding my report and awards in connexion with the Farm Competition recently carried out under the auspices of your Society. It has been most interesting to me, for the third time, to have the opportunity of witnessing the agricultural progress of the Nhill district, and it may be of some service to your farmers to have an independent criticism of their methods and practice.

I can congratulate your Society in having, through the medium of these Farm Competitions, brought about a most commendable spirit of emulation between land-owners, which is reflected every year in the building of more commodious homesteads, and a general improvement in stock and implements. One other excellent feature made prominent by the Competition is the demonstration of methods whereby the sandy Mallee country is being subdued and made productive. It would be hard to overestimate the value to the State, of the solution of these and allied problems, and there is little doubt that much at present unoccupied country in northern Victoria will eventually be populously settled by the methods of treatment practised by some of your more progressive farmers.

Although the number of competitors in the section for Large Farms is not as large as it might be, a considerable amount of interest has been evinced, and the following detailed comments may be of interest:—

BEST FARMS OF OVER 640 ACRES.

(*a*) *The best system of cultivation and rotation pursued*—*15 points.*—The practice in this connexion varies very little in the Wimmera and might be termed the usual five years' rotation of the combined wheat and sheep farmer, viz., wheat, oats, two or three years' grass, fallow and crop again. On new land it is not uncommon to take two successive crops of wheat, but the necessity for sheep feed generally regulates matters in this direction. It cannot be said that much enterprise has been

shown in the direction of the cultivation of crops such as rape, peas or grasses on any extensive scale, but Mr. H. E. Dahlenberg has made a departure this year in the sowing of melilotus and rye grass with his wheat crop, which will enhance the feeding value of the stubble.

(*b*) *The best system of manuring, names and quantities used per acre—10 points.*—Here again practice varies very little among Wimmera farmers. The superphosphate is universal, and the amount used per acre ranges from 45 to 60 lbs. The addition of a small amount of bone-dust to the superphosphate has been tried by Messrs. Dufty and Sanders, and should be productive of good results, especially where the succeeding oat crop is not manured. Stable manure is, in all cases, ploughed into the clay patches at the time of fallowing. The amount used, however, is too small to show any appreciable effect, although it exercises a most beneficial action in rendering these patches less liable to run together and bake.

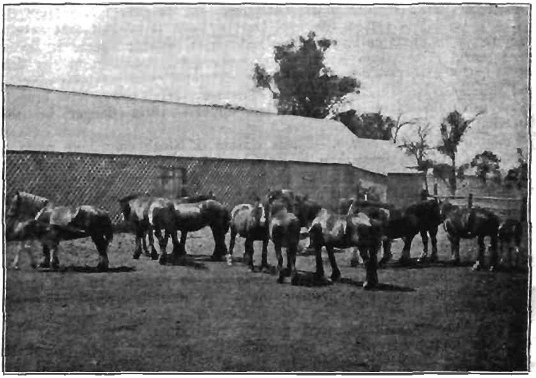
A FARMER'S HOME IN THE WIMMERA.

(*c*) *The best system of saving stable and other manures—5 points.*—No particular care is exercised by the majority of farmers in conserving stable refuse. The usual heap adjacent to the stable, more or less neatly stacked up, is universal. It might be pointed out, that at this season of the year, there is not any great accumulation of manure, and what there is, must deteriorate considerably before it is used up during next fallowing season. Where cows, pigs and poultry are kept, it would be an advantage to thoroughly mix the manures and cover with earth.

(*d*) *The best and cleanest growing crop—10 points.*—The limited number of points allotted for this item in the farm section hardly permits of great distinctions being made. Both Messrs. John Dufty and Son and Stapleton have a fairly considerable area of crop on new Mallee land, the low yield of which depreciates their crop as a whole. Mr. Dahlenberg has 100 acres of wheat on Mallee land, which, having been previously cropped and grazed, shows considerable improvement. Messrs. Sanders and Crouch have both good crops on soil of a different nature to the other competitors. In all fields the wild oat is conspicuous,

but as some benefit will be subsequently gained in the shape of feed, no great disadvantage is attached to this matter. The uniform presence of foreign heads, however, is, to my mind, a more serious affair. I have on many occasions drawn farmers' attention to the advantage of having pure seed. The Nhill district is not singular in this respect, but the drawback is on the increase, and, sooner or later, farmers will be compelled to take steps to remedy it. The hand picking of small lots of grain for seed is a matter worthy of attention, and I am pleased to note that in a number of cases this practice is being followed. Pure seed should always command a slightly higher price for sowing purposes.

(*e*) *The best system of fallowing and working fallow—15 points.*—The preparation of fallow this year has been considerably impeded by unseasonable weather, the effects of which are very noticeable in some



USEFUL TYPE OF FARM HORSES.

paddocks. Spring rains permitted the greater portion of each competitor's fallow being worked, but on most farms there are portions still untouched. On the whole the fallow is clean, and will be kept so by grazing. Mr. Dahlenberg's fallow is particularly good, having been gone over with a "clod crusher," an implement which should gain in favour.

(*f*) *The best and most profitable classes of live stock—15 points.*—It is in this matter that the success of the large farms is most apparent. All the competitors devote considerable attention to the improvement of their horses and sheep, and in the case of cattle, pigs, and poultry there is also evidence of attention:—

Horses.—The high standard of the Wimmera farm horses generally is well maintained in the Nhill district. Good class mares on the lighter and perhaps more active side are more common than the heavier type, although it must not be inferred that size or bone is sacrificed by breeders. Messrs. John Dufty and Son, Dahlenberg, Sanders and

Crouch are the possessors of animals of unusually good class and evenness. Mr. Stapleton's horses do not show the same quality, and, although well fitted for their work, are more uneven in age and size. The two years' old, yearlings and foals of which each competitor has a number, reflect the advantage of the good class entire horses which have been introduced into the Wimmera of recent years. I might remark that I see a marked improvement in the type of farm horse now in vogue, to that of four years ago. Messrs Sanders and John Dufty and Son keep entire horses, the other competitors do not. Of the lighter horses, little more need be said than that they are quite suitable for their purpose.

Sheep.—Some distinction must be made in this item according to whether sheep are bred for wool or lambs. Mr. Sanders devotes more attention to the former, whereas, the other competitors either incline to the raising of "freezers" or combine breeds for both purposes. I have been much struck by the general excellence of the sheep, and from the prices secured this season for wool and lambs it is evident that careful attention is paid to culling and no reasonable expense spared to secure good rams. The sheep were in uniformly good condition at the time of my inspection, and there was on most farms, a good provision of grass and stubble to carry them through the summer. High prices have brought about fairly heavy stocking, but there appears little danger in this direction.

Cows, Pigs and Poultry.—These classes of stock contribute more to the comfort of the farm than to its financial improvement. Several head of cows for the domestic milk supply, pigs for bacon, and poultry for an abundant supply of eggs are features of each homestead. The young cattle are either fattened off and sold locally, or else replace the older ones. If it were feasible to land eggs in the large centres of population without much trouble or expense, I have no doubt more attention would be paid to poultry as an industry.

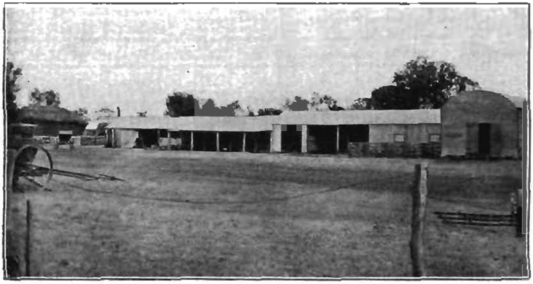
(*g*) *The best implements and machinery—20 points.*—In this respect Mr. Dahlenberg occupies premier place. A recently-erected oil engine and chaffcutter, new binders and harvesters, complete equipment of ploughs, harrows, drills, seed grader, cultivators, earth scoops, land levelling implements discs, farm waggons and many other useful implements are all so well looked after that it would be difficult to add to it. The farm plants of Messrs. John Dufty and Son and Sanders are also worthy of the highest mention. Portable engines, oil in the former and steam in the latter, are to be found executing a variety of farm work on both properties. Mr. Sanders having lately installed a machine-shearing plant, finds his engine invaluable during shearing time, and also for chaff-cutting and wood-sawing. Messrs. Crouch and Stapleton have not, so far, gone in for machinery of this character, although their ordinary farm plant is of a comprehensive nature.

(*h*) *The condition and system of fencing—10 points.*—The fences, both boundary and subdivisional, in all cases are good, consisting chiefly of five plain wires and a barbed wire. Fencing of this character is sheep and cattle proof, and could not well be improved upon. Little or no netting is made use of. The gates, which are always prominently brought under the notice of the judge and those visitors who accompany him, are generally good.

(*i*) *The best kept Kitchen Garden and Orchard—10 points.*—On the properties of Messrs. John Dufty and Son, Stapleton, Sanders and Dahlenberg the orchard in close proximity to the house, is a most pleasing feature.

Varieties of fruits and vegetables are present in abundance, and the care bestowed upon this portion of the farm is repaid a thousand-fold in the domestic arrangements for preserves, &c. Mr. Crouch has not made the same provision in this direction.

(*j*) *The best provision for Water Supply—30 points.*—On a farm of any size, especially in a dry climate, there is perhaps no more essential factor towards success than an adequate water supply. In this connexion all the farms are well served. Messrs. John Duffy and Son, Sanders, Crouch, and Dahlenberg have dams, the former also several windmills, in a great number of their paddocks, and in those not so supplied, stock have easy access to water. Mr. Stapleton's property is equally well watered, largely by medium of windmills pumping from wells into small dams, which has the advantage of keeping the water always fresh and not so liable to be fouled by stock when drinking. Windmills to furnish a house supply of water are found at Messrs. Dufty and Son, Dahlenberg, Sanders, and Stapleton's. In all cases, adequate provision is made to store rain



A COMPETITOR'S FARM YARD SHOWING SHED ACCOMMODATION.

water for domestic use. I am of opinion that it would be difficult to find, in northern Victoria, a greater amount of attention paid to water storage than is the case on many of the farms in the Nhill district. Not only are the dams well located for catchment and accessibility, but they are of good capacity and in a great many cases are screened by trees which minimise evaporation.

(*k*) *Best arrangement and system of Dwelling and Farm Building—20 points.*—In this item the financial progress of the owner may be guessed at. The influence of attractive surroundings, both external and internal, counts for much in isolated places, and it may well be a matter for pride to the owners of these fine properties under review to know that in each and every case they impressed me with their substantial nature and homelike character. The installation of acetylene gas in the dwelling and stables at Mr. Sanders marks a distinct step in farm homesteads. In regard to the outbuildings, the usual pole and thatch roofed sheds prevail in all cases, except that of Mr. Dahlenberg, who, since my previous inspection of his

property in 1903, has substituted commodious iron buildings of a substantial character. Messrs. John Dufty and Son, and Dahlenberg are to be congratulated upon their newly erected well finished shearing sheds and smoke-houses.

It may not be out of place to mention that a number of buildings with roofs of a highly inflammable nature should not be allowed to occupy too cramped a space, and there is room for improvement in this direction.

The visitor to all these farms cannot fail to take away with him the idea that the owners are there to stay, and their enterprise might with advantage be copied by the farmers of the surrounding districts.

POINTS AWARDED.

—		A.	B.	C.	D.	E.	F.	G.	H.	I.	J.	K.	Total.
J. Dufty and Son	..	13	10	4	7	14	15	18	10	10	30	18	149
H. E. Dahlenberg	..	14	9	4	9	15	13	20	9	10	25	20	148
W. Sanders ..	..	12	10	4	8	14	14	20	9	10	28	17	146
G. Crouch ..	..	13	9	5	10	15	14	17	8	8	25	16	140
J. Stapleton	..	12	9	3	7	13	11	16	10	10	25	17	133

The above decision has been arrived at after several days of most careful criticism, due attention having been given to every detail. I have awarded Messrs. John Dufty and Son the maximum points for water supply, not because they have the most dams, nor the greatest capacity, but because their dams and windmills are splendidly located to serve two or three paddocks at the one time, whereas Mr. Dahlenberg's three largest dams are all close to the homestead, and in some cases, two dams are in one paddock. Moreover, Mr. Dahlenberg's property embraces a farm of 620 acres situated some seven or eight miles from his main property, whereas Messrs. John Dufty and Son's holding is more compact and therefore more easily worked.

In the matter of stock, I have had to consider that Messrs. Dufty and Son keep an entire horse of their own while Mr. Dahlenberg has to pay for service. I think Mr. Dahlenberg's sheep are superior to Messrs. Dufty's, but in cattle and pigs, the latter gentlemen are breeders, whereas Mr. Dahlenberg only partly owns a bull, and does not breed his own pigs. In other matters there is little to choose between these two fine properties. Mr. Sanders is a highly creditable third, and were his outbuildings of more modern construction and not, in case of fire, so dangerously close to his fine dwelling, he would have been nearer. His sheep are perhaps the best shown, and his horses compare favorably with those of other competitors. Messrs. Crouch and Stapleton's properties compare favorably with other competitors in all details except implements and machinery, water supply, dwelling and outbuildings.

BEST FARM UNDER 640 ACRES.

In this section the decision has been much simpler than in the preceding class. Mr. E. Hoffman's compact well managed farm would be hard to beat in any district in its own class. Messrs. McIntosh and Eastick's properties are no less compact, but their operations are hardly comparable.

The property of the former gentleman is a mallee block. The scale of points is the same as already set out for the large farms.

Competitor's Name.	A.	B.	C.	D.	E.	F.	G.	H.	I.	J.	K.	Total.
E. Hoffman	13	10	3	7	15	13	20	9	10	25	20	145
A. McIntosh.. ..	14	9	3	8	14	12	15	9	9	23	17	133
R. Eastick	12	9	4	9	13	12	14	8	7	20	17	125

THREE-FOURTHS OF A FARMER'S WHEAT CROP ON FALLOW.

In this class there has been good competition, and the crops inspected may be claimed to represent the best in the district.

Name.	Cleanness.	Trueness to Type.	Freedom from Disease.	Apparent Yield per Acre.	Total.
	10 Points Maximum	10 Points Maximum.	10 Points Maximum.	1 Point for each Bushel.	
T. Ervin	9	9	10	24	52
J. W. Smith	8	10	9	24	51
C. Huf	9	9	9	22	49
J. Bond	9	10	9	20	48
G. Crouch	9	9	9	20	47
M. Rees	9	9	9	17	44
G. Batson	8	8	9	16	41
T. W. Walters	8	8	9	16	41
A. W. Campbell	7	7	9	17	40

BEST 100 ACRES OF WHEAT ON MALLEE LAND.

It is satisfactory to find such a large number of competitors in this section. As may be seen by the points awarded, the Mallee crops shown are exceptionally good considering the season.

Name.	Address.	Cleanness.	Trueness to Type.	Freedom from Disease.	Apparent Yield per Acre.	Total.
		10 Points Maximum.	10 Points Maximum.	10 Points Maximum.	1 Point for each Bushel.	
R. Clark ..	Woorak West	9	9	9	20	47
R. Eastick ..	Tarranginnie	9	9	9	14	41
A. McIntosh ..	Ni Ni East	9	8	8	14	39
H. E. Dahlenberg	Winiam East	9	9	9	12	39
Roberts Bros. ..	Gerang ..	8	9	9	12	38
J. Forrest ..	Nhill ..	8	7	9	12	36
W. Krelle ..	North Yanac	8	9	9	10	36
H. McIlraith ..	Salisbury ..	7	8	8	10	33
J. Dart ..	Woorak West	7	8	9	6	30

It may not be out of place to express the opinion that the special circumstances surrounding the cultivation of Mallee land, demand a wheat which will meet those conditions. The natural shortness of straw, large, well filled ear and early maturity of the "Federation" variety appear to me to offer special advantages on Mallee land, and I have no hesitation in recommending this wheat to Mallee farmers.

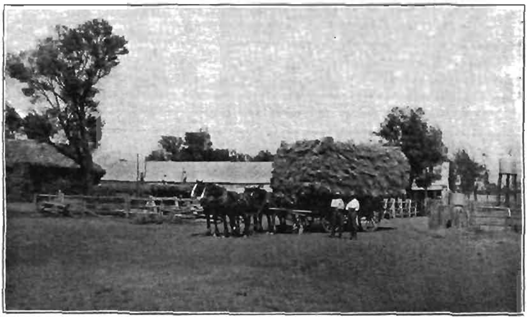
BEST FALLOW, NOT LESS THAN 80 ACRES.

In this section there were only six entries, which, considering the importance of fallow land, is disappointing. In this district, where farming methods are on the up-grade, I consider that the number of entries for fallow should be much larger. It is quite probable that the unsatisfactory weather during the months of June, July and August and the consequent need for more working in the spring have been the cause of the low entry.

Name.	Address.	Maximum Number of Points—20.
W. Sherwood	Haycroft	20
G. Crouch	Kaniva	19
C. Batson	Haycroft	18
H. Dahlenberg ..	Woorak	17
A. McIntosh	Ni Ni East ..	17
T. Ervin	Woorak	16

BEST EXPERIMENTAL WORK OF ALL KINDS.

In this matter again, I am sorry to see such a poor entry. Small



DROUGHT RESERVES.

trials of new cereal varieties, different kinds and rates of artificial manures, cultivation tests, grasses, trees, &c., are all matters in which the progressive farmer is profoundly interested. The Government experimental fields can necessarily only reach a very limited number of farmers in a district, and there is thus created the necessity for parallel tests on different soils to the Government field.

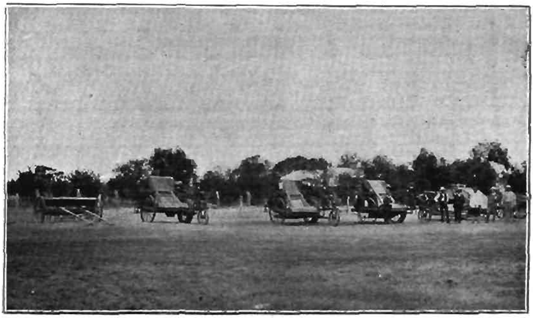
I award the first prize to Mr. H. E. Dahlenberg for the variety and scope of his experiments which embrace trials with wheat, oat, and barley varieties, the cultivation of flax, the sowing of rye grass and melilotus with his wheat crop, subsoiling, filling up crab holes by means of a land grader, and other minor experiments. Mr. Batson, the only other competitor, is also conducting trials with wheat, oat and barley varieties, rye grass, &c.

A trial of different fungicides used in pickling wheat also forms an interesting experiment.

I am of opinion that in future competitions, the Nhill Agricultural and Pastoral Society would materially assist the work the Department of Agriculture is carrying out, by encouraging farmers to conduct experiments on definite lines. Seed trials are useful to a certain degree, but alone they do not constitute experimental work, and they might with advantage be supplemented by tests of different methods of cultivation, drainage, trials of implements, and numerous other matters having a direct bearing on the productiveness of the soil.

Novelties on the Farm.

Although not included in the competition, I have been much impressed during my inspection of both large and small farms by the enterprise, ingenuity and resourcefulness displayed by most competitors in one form or another. Messrs. Dufty and Son show commendable enterprise in the building of farm waggons and general repair work. Mr. H. E. Dahlenberg has a cemented pit for wheat pickling, and a cemented swimming tank for ducks. Mr. Stapleton displays great ingenuity in the fastening of gates. Mr. Sanders is to be complimented on the installation of acetylene gas and sheep-shearing machines. Messrs. Crouch, Hoffman,



FACTORS IN SUCCESSFUL WHEAT FARMING.

McIntosh and Eastick have also useful contrivances which help to minimise the tedium of farm work.

Some Suggestions for Future Competitions.

I cannot conclude this comprehensive report without offering some suggestions which the experience of three years' judging leads me to believe would be to the general advantage of the competitions in the future.

The present scale of points does not permit the judge to adequately reflect his opinion in the important items of (*f*) best and most profitable classes of live stock kept on the farm; (*g*) the best implements and machinery; (*j*) the best provision for water supply; (*k*) the best arrangement and system of dwelling and farm building.

Considering that the large farms are dependent more upon grazing, mostly sheep, than upon cropping, the necessity for sufficient latitude to draw distinctions between different classes and qualities of sheep, is emphasized. In the matter of water supply, the points could be extended with advantage. In regard to the arrangement of dwelling and outbuilding, an extension of the present points might also be made. Coming now to such matters as (*a*) system of cultivation, rotation, &c., (*b*) system of manuring, I think that the practice in these directions varies so little that they might be grouped together and receive 25 points. Regarding (*c*) the best system of saving stable manure, I would exclude it altogether. For (*d*) best and cleanest growing crop, I would extend the points to 20, and would consider the oat crop with the wheat. I would alter item "H" to read: "The best system of boundary and subdivisional fencing, including gates and sheep yards—15 points." I would, moreover, include extra points for fodder reserves, farm and stock insurance, and tree planting.

To make a concrete suggestion, I offer the following scale of points for the consideration of your Committee:—

	Points. Large Farms.	Points. Small Farms.
(*a*) The best system of cropping, including cultivation methods, rotation, and manures	25	20
(*b*) The cleanest and best crops, including oats	20	20
(*c*) The fallow in best order, area to be considered	20	20
(*d*) The best quality and serviceable classes of stock kept on the farm—Horses 20 points, sheep 20, cattle, pigs and poultry 5	45	30
(*e*) The most complete equipment and class of implements and machinery	20	20
(*f*) The best system of boundary and subdivisional fencing, including gates and sheep yards	15	10
(*g*) The best kept orchard and vegetable garden	10	10
(*h*) The best arranged system of water storage, points to be given for number of dams and windmills capacity, location for catchment, accessibility to stock and ease of watering	45	30
(*i*) The best arranged dwelling and outbuildings	20	20
(*j*) Best reserve of fodder of any kind	15	10
(*k*) Best efforts in direction of tree planting	5	5
(*l*) Farm or stock insurance	10	5
Total	250	200

EXPERIMENTAL WORK.

This section might be made to extend over three years, and competitors would be required to submit to the judge any results obtained. I would be glad at some future date, to assist your Committee in drawing up regulations which would clearly define the objectives of each class of experiment.

CONCLUSION.

In framing my report on such comprehensive lines as has been done, I am guided by the far reaching value of competitions of the nature under review and the necessity for continuous improvement thereon. The work has been highly educative to myself, and the opportunities to discuss matters pregnant with interest to the farmer, of the greatest value to my Department. I cannot sufficiently thank my hosts during the judging for their hospitality, nor can I over value the great assistance rendered by yourself in the discharge of the duties of honorary steward. The farm competitions of 1907 will long remain as a pleasant memory to me.

BACCHUS MARSH FARM COMPETITION, 1907.

G. Harmer, Dairy Supervisor.

REPORT TO THE SECRETARY OF THE BACCHUS MARSH, BALLAN, AND PENTLAND HILLS AGRICULTURAL SOCIETY.

I have pleasure in forwarding to you the results of my judging of the farm competition held under the auspices of the above society.

It is unfortunate that the season is so adverse for farming and agricultural pursuits generally, but I have based my awards on the conditions of a normal year, making due allowance for the prevailing conditions.

STOCK.

It is very pleasing to note the effort that is being put forth to improve the class of stock in this district. On one farm, I saw almost a typical herd of Milking Shorthorns. It is a pity the scales and Babcock tester are not in evidence on this farm. No matter how good-looking a herd may be the farmer is working a good deal in the dark with regard to actual profits unless he keeps records of both the quantity and quality of milk produced by individual cows. On the other farms no one type stands out very prominently, although there are some specially good all-round dairy cows amongst them. These are the class whose progeny should be kept to supplement the herd from, provided the weight of milk per year and test are in keeping with their appearance and type. On one farm only were the records kept anything like regularly, and this accounts, perhaps, for the herd in this case having been apparently the most profitable I encountered. It takes very little time to find the robber when a herd is managed with this aid.

The country is specially adapted for dairying, having an abundant supply of good water; and the land is such that, with proper tillage, it would grow almost anything—besides being first class grazing land. There is no reason why high records should not be obtained, both as regards weight of milk and test.

The Shorthorn seems to be the sire most generally preferred, and perhaps he is the most suitable, provided enough care is taken in choosing one that has descended from a right milking strain. The advantage is that in cases of failure at the bucket they can be readily fattened on the farms and sold to the best advantage.

Horse breeding is not altogether neglected in this district. I saw on some of the farms inspected some splendid draught brood mares that have taken prizes and would compare favorably with the best in the State. Some had foals at foot that promise to be as good as, or better than, their dams, so that good sires must be in use. One or two farms I thought to be deficient in this respect. A brood mare is a good money-making machine. She will do her share of the heaviest slow work and rear a foal as well. In this way it is easy to keep up a good team of horses with very little actual expense.

Sheep appear to do remarkably well. I saw between 2,000 and 4,000 on the farms competing, and did not notice a weak one amongst them. This speaks well for the all-round management prevailing. First crosses (Lincoln-merino) and Shropshires seem to be the favourites. Several farms go in for stud Shropshires, and although they are on the down-grade in the market generally, very satisfactory prices have been obtained for any stud

rams that have been offered, showing that care has been exercised to maintain high quality in this branch also.

On the whole the stock is good and perhaps above the average, judging from appearances, and if the same care in breeding is taken in the future as has been in the past, and the scales and tester introduced into the milking shed, a few years should bring the dairy stock up to a very high standard.

IMPLEMENTS, MACHINERY, AND OUTBUILDINGS.

There is nothing very striking in this line on some of the farms. Mr. Mogg stands out particularly as having all the machinery required for the proper cultivation of his land and for harvesting. The same can be said of his farm in regard to outbuildings. A well-kept shed is provided for the storage of the implements, and, more than that, he sees that they are put in when not in use. On the other farms, with the exception of drays, buggies, and waggons, although fair shed room is provided, the implements are less conspicuous there than in the paddock in which they were apparently last used. Nothing gives a worse appearance to a farm than seeing implements all over the place.

In a district where lucerne is, and can be, grown so successfully it is strange that I came across only one cultivator. A cultivator, whether disc, spring tooth, or rotary disc harrows, is a great help. It not only assists in getting the ground ready, but it is good on the lucerne pasture as it disintegrates the roots causing a much better stool of the plant and at the same time loosens and enlivens the soil. By doing this the life of the lucerne is considerably prolonged especially on land that has been grazed.

WATER SUPPLY.

In this matter, Nature has done a great deal for the district, but with one exception little has been done by the farmers concerned to supplement the natural facilities. There were streams and springs on all the farms visited, and with little trouble and expense a supply could be had for all time. It is a great saving when water is available in every paddock, as stock do better when a long distance walk to water can be avoided. One or two of the springs were about dry at the time of my visit, whereas if a dam had been made, there would have been an adequate supply.

Mr. Kerr is the exception alluded to, and he has one of the best water supplies I have seen, having two 400-gallon tanks, on stands, supplied by wind mill from the river and laid on to house, garden, stables, dairies, calf paddock, &c. He also has the river running through his property, and a very fine channel off-shooting from the river higher up that he uses for irrigation purposes.

CULTIVATION.

There appears to be room for all round improvement in this branch. Lucerne is perhaps the best fodder known, but this plant will not thrive everywhere, and in these cases it is well to grow something that will—for instance, a paddock of rape which, besides being a soil restorer, will fatten a lot of lambs. Where the milk is separated and pigs fattened, mangolds, carrots, or some other root crop could be grown to advantage. If this were done brood sows (which are very scarce) could be kept at a nominal cost, and consequently a better class of pig raised than I saw. A man never sells his best pigs, and so buyers really have to take a lot of rejects or runts. These do not thrive or grow into money like well-bred

ones. I saw a rape crop on only one farm (that of Mr. Dugdale). It is bound to show him a profit as he has been able to top off two separate lots of sheep and in addition the land will be thoroughly cleaned of wild oats and other objectionable weeds. Mangolds, too, are a good feed for cows if pulped and mixed with straw chaff; although not a good ration by themselves they will keep the cows in first class condition.

The growing of maize appears to be almost wholly neglected. I think it would be better to grow more fodder of this kind to throw out to the cows and thus save the lucerne (a great deal of which is now wasted) for hay. Maize cannot well be made into good hay, but it is a splendid food when fed in the green state. I am sure prolific crops could be grown on the class of land I saw if properly worked and especially if the stable and farm-yard manure, which at most of the farms was lying about exposed to sun and wind, was used in the cultivation. If farm-yard manure was more used in growing crops of this kind more attention would be given to its proper conservation and a very great saving effected each year.

FENCES.

The fences on the farms visited were, on the whole, good, a great many being rabbit proof and all of them sheep proof. This is not to be wondered at, a supply of first-class timber for posts being available. I did not see as many posts and rails stored at the homesteads as I would like. When a post or rail is at hand it can be put in immediately and the fence kept good, but if a tree has to be felled and posts split the fence has a good chance of going to pieces. I noticed a boring frame and a fine heap of posts on one place. This showed a tendency to take advantage of a wet day, and a due appreciation of the only way to keep the fences in thorough repair.

A regrettable feature noticed on one of the best farms, which duly lost points for it, was the presence of log fences in parts, furnishing a harbour for rabbits, which were plentiful. At this property also the absence of gates, except round the homestead, was a notable deficiency.

Mr. Meyer's farm was the only place where I noticed any hedge. On the hilly lands of the district the wind must sweep over them with great violence, whereas if hedges were planted and kept in good order they would be a great break-wind for the crops as well as shelter for the stock. Nothing looks nicer than live fences well kept. They may take some plant food from the surrounding soil, but I saw enough idle land elsewhere on the farms to grow all the hedges required. If a man won't plough the headland he does not value the land very much. The argument does not apply, either, when a log fence is allowed to remain. It takes up more ground than a well-kept hedge and is a harbour for rabbits as well

Subdivision into small paddocks is an advantageous feature and this is carried out fairly well on the competing farms the whole of the farmers having well laid out paddocks so arranged that when grazed the stock has fairly easy access to water.

THE GENERAL MANAGEMENT.

This, on the whole, must be considered good, seeing that there are only eight points dividing the first four farms. In the laying-out of farm buildings, it is always well to give some consideration to the minor ones, such as pig styes and calf pens. With few exceptions there appeared to me to be neglect in this regard. Both pigs and calves are a valuable

adjunct in dairying and a good warm house is essential if the best is to be made out of them. A good calf pen should have plenty of light and air, without draughts, and should be provided with a low set rack for the holding of some sweet hay. If this is provided, after having their milk, the calves will almost invariably turn to chewing it instead of indulging in that bad habit of sucking each other. If a smaller pen is set aside for the young ones and they are left there till they take to the milk readily much annoyance is saved. Calves and pigs kept in a warm dry shed, so built that the morning sun can reach them, will do with much less food than those kept in cold draughty surroundings.

I saw some good pig styes and some very indifferent ones. It is much better to have a drain leading to a compost heap instead of soaking away over the ground. The same might be said concerning cow sheds. I cannot understand a farmer in a reasonably comfortable financial position waiting to be asked by a supervisor to pave and drain his cow bails with bricks. If farmers took into consideration the time and labour that a stone floor involves they would soon be convinced that in two or three years a brick floor pays for itself in the saving of labour alone. Besides being easier and quicker to clean out, milking can be got through better and with less annoyance, and further it is very pleasing to see a well paved shed.

While efforts are being put forth to improve the breed of horses, cattle and sheep no attempt seems to be made for the improvement of pigs. I did not see a brood sow on any of the farms inspected and the class of pig seen in the styes was not the most profitable, although up to the average generally kept on farms. But one expects to find a class of animal a little out of the ordinary on farms entered for a competition.

In conclusion I will just state that in awarding the points I gave the merits and demerits of each farm my undivided attention from start to finish, and if some of the contemplated improvements are carried out by some of the competitors it is quite possible the order of merit will be reversed on another occasion. If any of the competitors wish to know my reasons for allotting them points either high or low I will be pleased to state them. Further, if any of the comments I have passed on the farms collectively bear good fruit in the direction of setting the owners thinking, I will be satisfied, as it is from want of thought that half our troubles come.

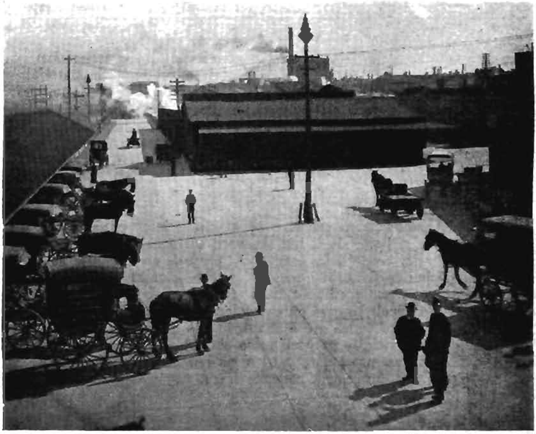
SUMMARY OF POINTS AWARDED.

Name of Competitor.	Cows in Milk—not less than Five (Type only).	Ring and Subdivisional Fences.	System of Water Storage required for each Farm.	Best and Most Suitable Class of Stock (including Poultry) for each Individual Farm.	Best Garden—including Orchard.	Best System of Cultivation for each Farm.	Best and Most Suitable Class of Outbuildings—Barns, Stables, Sheds, Dairies, &c.	Best and Most Suitable Farm Implements.	General Management.	Total Number of Points.
B. B. Mogg	9	11	7	9	6	8	11	11	10	82
W. Dugdale	10	9	9	10	6	9	9	9	8	79
J. Kerr ..	11	6	11	9	8	7	10	7	7	76
T. Meyers ..	9	9	9	10	7	6	9	9	6	74
T. Shanahan	7	7	11	10	4	6	5	4	4	58
J. Shanahan	5	7	9	8	4	5	6	2	3	49

PAVING AND DRAINAGE OF MILKING SHEDS AND YARDS.

A. S. Kenyon, C.E., Engineer for Agriculture.

The sanitary equipment of modern dairy farms is so necessary and essential to success that no farmer can afford to ignore it. The old tumble-down dirty cowshed has given way to the wholesome and clean milking sheds now found on up-to-date dairy farms. The milking sheds described and illustrated in the article "Dairy Farm Buildings," by Mr. S. S. Cameron, M.R.C.V.S., Chief Veterinary Officer, in the *Journal* of February, 1907, are fast becoming the possession of the progressive farmer. It is impossible to add anything to that very complete and



CAB YARD AT SPENCER-STREET STATION PAVED WITH "GRANOLITHIC."

practical article, containing, as it does, all the latest obtainable information on the subject. The sketches show the floor paving and the grip of the milking shed carried out in brick work. This material, when properly laid and thoroughly grouted in cement compo, makes a useful paving. It has, however, one great disadvantage as a sanitary surface covering, viz., the very large number of joints it possesses. The spaces between the bricks are filled with cement mortar, a different material from the bricks, and left with fairly rough surfaces. The grouting has a great tendency to crack, and the rough surfaces of the joints retain and absorb a good quantity of the deposited urine and liquid manure. However, there has been no other paving obtainable at a reasonable price, and the brick paving has been practically accepted as the standard floor for dairy farm purposes. The recent introduction of a new paving called "Granolithic"

has, however, made the position different. The accompanying illustration is reproduced from a photograph of the cab yard at Spencer-street Railway Station, which has been recently transformed from a muddy, uneven, and dirty surface to its present hard, smooth, clean, and attractive appearance by the adoption of this new paving. It would appear to be very suitable for dairy farms and other similar purposes, because of its evenness, absence of joints, and impervious nature. It forms one mass pavement, and the formation of gutters, grips, and other drains, is made in the material itself. The material has a foundation of cement concrete, and upon this is laid a top coating of patent "Granolithic"; this, when hardened and chemically treated, is of such extreme toughness, that it will carry over its surface the heaviest and fastest vehicular traffic, as the illustration shows, without any wearing or cracking of the surface. Its advantage over brick paving is thus apparent; even, hard surface, absolutely impervious, no surface joints, or liability of cracking, and no tendency for cows to slip on same, the whole floor from tying post across grips, passage, &c., to tying post on the other side being formed in *one even*, complete surface. The cement concrete could, for economical purposes be composed of broken bricks, gravel, or other such material, in places where crushed bluestone is not available. The "Granolithic" coating is laid by special skilled men in the employ of the Granolithic Paving Company, Melbourne, who can furnish information as to prices, &c. It is understood that this material has been largely used by the dairy farmers of Western Australia, and has given uniformly successful results. It would appear to be an ideal paving for farm purposes and butter factories, and of decided advantage in securing the most sanitary and permanent results.

It would be difficult to conceive of anything more suitable for farm use, not only the milking shed, but the yard surfaces, stables, etc., paved with "Granolithic," would be practically perfect, and for use as paving and lining of butter factories, creameries, cool stores, piggeries, etc., it would be certainly more efficient than the more costly tiling usually adopted. It is difficult to give an exact idea of the cost of a proprietary process, the details of which are a secret, but as a guide, it may be stated that paving in the vicinity of Melbourne should be laid by the Company for not more than 7s. per square yard or as low as 5s. if the farmer supplies the gravel for the cement concrete layer.

TRANSPLANTING TOBACCO PLANTS.

T. A. J. Smith, Tobacco Expert.

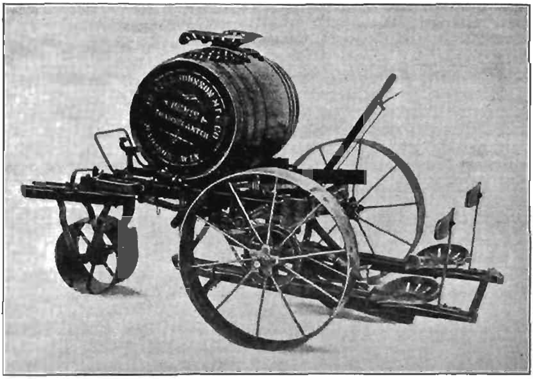
Many tobacco-growers are not aware of the fact that efficient machinery can be obtained for the purpose of transplanting the young plants in the field after their removal from the plant beds. The question of getting suitable labour for this portion of the work is becoming more and more serious; higher wages have to be paid at the present time than was the case a few years ago, and in many cases, the difficulty in procuring suitable hands for pulling out the plants has had the effect of limiting the area of tobacco fields to a considerable extent.

Transplanting by hand is naturally a slow process and the work tedious and tiring. The machine obviates these difficulties to a wonderful extent, the work being reduced to a minimum and is done better than by hand. The old system necessitated a man going ahead of the planter with a hoe

to break up the soil where the plant was to be placed; the planter put in each plant by hand, and he was followed by another man carrying buckets of water and watering each plant. This method entailed covering the plant with grass to prevent baking of the soil round the plant and scorching it.

The machine is drawn by two horses and is of light draught. It rolls the ground, ploughs and works the soil immediately before the plant is put in the ground, and waters the plant under the surface, leaving a dry well worked mulch on top. It also distributes a fertilizer if required, and marks out the next row for the machine to travel down. There is no hoeing required, no carrying of water, and the whole of the work is done by a man and two boys, all of whom are provided with seats.

A good day's work for three men under the old system was an acre in two days, but with the machine three men can with ease transplant three acres, or in other words, put out 10,000 plants. The great feature, however, is that the machine planted tobacco actually grows better, and with a smaller percentage of misses, than where the plants are put out by hand. This is due no doubt to the fact that the soil is worked up to the last moment, and that the plants are set in water with a dry mulch covering which prevents evaporation and caking of the soil.



THE BEMIS TRANSPLANTER.

The machine is most useful on the farm in many other respects, as it also plants maize, potatoes, broom corn, and would, I think, prove of great use to market gardeners for transplanting cabbages, tomatoes, &c. It has been proved suitable to Victorian conditions, the great desideratum to gain best results being a thorough preparation of the soil beforehand, a matter that should be attended to in any case. The cost of the machine, which is an American invention, is £16 delivered in Victoria. It is simple in construction, and with ordinary care should be very durable, and smart boys can learn to manipulate it in a few minutes. For planting potatoes, maize, and many other crops, it can be worked with one horse and two men or boys.

SECOND PROGRESS REPORT ON VITICULTURE IN EUROPE.

F. de Castella.

I have the honour to report as follows on the work done during the month prior to my arrival in London.

As already stated in letters, after having inquired into Swiss methods and results, at Lausanne and other points in the Canton de Vaud, and at Colombier, Auvernier, etc., in the Canton of Neuchâtel, I proceeded to Dijon, whence I went south again as far as Villefranche, the capital of the Beaujolais district, where wines of a quality intermediate between the cheap wines of the "Midi" and the celebrated Burgundies of the Côte d'Or, are produced in very large quantities. These wines are among the best of the cheaper wines of France; they are of sufficient quality to be worth bottling and keeping for a few years, instead of being consumed before they are eighteen months old, the fate of the cheap "vins ordinaires" of the Midi, which seldom improve sufficiently in bottle to be worth maturing. The Beaujolais wines are of similar quality to many of our Australian light wines, though still lighter. They are very agreeable, and the type of wine a French business man likes to take with his lunch.

As was the case in Hermitage, the Beaujolais district resembles Australia in the absence of excess of lime in its soils. The climate is colder, though, than that of our Victorian wine districts.

In Beaujolais I visited vineyards, experimental plots, and collections at Villefranche, Belleville and Chiroubles, and also in the adjoining Mâconais. This district is intermediate between Beaujolais and Burgundy, so far as geographical situation is concerned, but the quality of the wine is scarcely equal to that produced in those districts.

Burgundy was next visited. Reconstitution here has been completed for a good many years, though not for quite so long a time as in the south of France.

Though the climate of Burgundy and Beaujolais is colder than that of the parts of Victoria where most of our vineyards are situated they are famed for quality. I thought it well to examine these districts rather fully, and to inquire more particularly into the effect of grafting on resistant stocks on the quality of the wine. Throughout central and eastern France and Switzerland one is struck by the amount of experimental work which is being done, with the happiest results so far as the instruction of growers is concerned, and the confidence in ultimate success with which they have thus been enabled to tackle the problem of reconstitution on a practical scale. In Switzerland experimental plots are usually conducted on private land, with the assistance and under the auspices of the viticultural branch of the State Department of Agriculture, whose well-known Viticultural Station at the Champ de L'Air, near Lausanne, has a European reputation.

I am pleased to be able to record a continuance of the same courteous receptions and hearty assistance from all those with whom the work of my mission has brought me in contact, to which I referred in my first report.

SWISS METHODS OF DEALING WITH PHYLLOXERA.

I referred in a previous letter to the remarkable results obtained in Switzerland from the extinction method.

I hope anything I may have said will not lead our growers to look upon it as a substitute for reconstitution on resistant stocks. This it most certainly is not. Even in Switzerland, though it was at first hoped that phylloxera could be permanently fought by extinction, it was soon found to be only a temporary expedient, but one which enables wholesale reconstitution to be very considerably postponed. Though I do not recommend the compulsory adoption of the method, I feel sure that individual owners of vineyards could, at small cost, gain much valuable time, thereby rendering the task of reconstitution far less onerous than the immediate reconstitution which soon becomes inevitable if nothing is done to check the spread of the insect. Of course the system must be applied at the very outset of the invasion; once the infested patches become numerous, it is too late to hope for good results. The salient features of the system are:—

1. Rigorous inspection to locate exactly all vines on which phylloxera has made its appearance. This should be carried out as early as possible in the season.

2. The immediate destruction of the diseased vines, by a sufficiently heavy dose of bi-sulphide of carbon, to kill both vines and phylloxera, and thus prevent the escape of any winged insects to further spread the infection.

3. The destruction of a safety zone of a few yards in width around the patch.

In practice, Swiss growers find that the average size of the patches it is necessary to destroy, inclusive of the safety zone, is not more than ten yards square. The climate of Switzerland is cold, and the spread of phylloxera slower than in Australia. It might, therefore, be thought that similar results could not be expected in the warmer parts of Victoria. In Algiers, however, where the climate is very like ours, I hear that results almost equal to those of Switzerland have been obtained, sufficient, at any rate, to render the Algerian application of the method worth inquiring into. In Switzerland vines grafted on resistant stocks may be replanted on an infested patch immediately after its eradication. Needless to say, the replanted vines must be raised in a nursery free from phylloxera.

In Switzerland, grafted vines are raised by private nurserymen who work under strict Government supervision. Formerly the Agricultural Department propagated and supplied grafted vines at £4 per thousand, but now this work is left to private enterprise. The nurserymen now supply them at from £5 to £6 per thousand for the more usual stocks, and at up to £8 per thousand for the newer hybrids. As Swiss vines are planted very close (less than 3 x 3 feet) it will be seen that the cost of the vines required to replant a vineyard amounts to a very considerable sum. This close planting is necessary in order to enable the grapes to ripen properly. This can only be insured by greatly restricting the yield of each vine. In order to get anything like a sufficient yield per acre, it is necessary to greatly increase the number of these little vines. These closely planted vineyards appear very odd to an Australian. This closer planting prevails throughout the cooler parts of Europe, always for the same reason, viz., to insure maturity of the grapes.

POPULAR STOCKS IN COOLER REGIONS.

Climatic reasons cause the estimation in which the principal American stocks are held to be sometimes different in the cooler districts from what it is in the warm south. The most notable difference is the esteem in which Riparia Gloire is held. In soils which suit it, and which do not contain lime in excess, it is very highly thought of. In Burgundy, large areas grafted on this stock have been giving satisfactory results for twenty years and more. The need for reducing the size of the vine in order to secure maturity of fruit prevents long pruning, which leads so often to the exhaustion of vines grafted on this stock. The want of durability of the Riparia stock so often noticed near Montpellier is no longer complained of in Burgundy or Beaujolais, though in Switzerland I have heard it mentioned. On the other hand, Rupestris du Lot is held in very poor esteem. Non-setting of fruit is the chief cause of complaint. North of Lyon this stock is not used to any extent, though it has been much experimented with.

The other stocks referred to in my first report give similar results to those noted in the south in the soils which they prefer there, 101^{14} for Riparia soils, 3306 for moist, compact soils, and 3309 for dry uplands. This last stock keeps up its wide range of adaptability. I have not yet found any one who has had any fault to find with it. Among the Franco-Americans, 1202 and A.R.G.1 are highly esteemed, though the latter is rather difficult to graft. Nurserymen cannot rely on a high percentage of first quality grafts. It is also stated that both these stocks ripen their fruit a little late. So far as the resistance of these vines to phylloxera is concerned, the evidence of Central and Eastern France is absolutely satisfactory. I have not been able to hear of a single instance where their resistance has been questioned.

One of the most curious facts I have noted is the popularity of a stock known as "Vialla," in the Beaujolais district. This is a seedling which grew in the garden of M. Lalimain, at Bordeaux. It appears to be a Clinton seedling, and to have sap of Vitis Labrusca and V. Riparia in its composition. Owing to the ease with which it may be grafted, and the affinity it possesses for most European scions, it was very popular some years ago in France. Insufficient resistance to phylloxera caused it to be soon abandoned in the south of France, where it has long since ceased to be used. Strange to say, Vialla is still held in great esteem in Beaujolais, and at the present day new plantations are chiefly made on this stock. In the deep schistose and granitic soils of Beaujolais, and in its cool climate, the resistance to phylloxera appears to be sufficient, and vineyards reconstituted on it over twenty years ago are still giving satisfactory results. It is held by authorities in the district to respect the quality of the wine more than many Americans. Another reason for its popularity is that the leading cépage of Beaujolais—the Gamay—is a bad scion. Considerable affinity appears to exist between it and the "Vialla." The popularity of this stock in Beaujolais is of interest. It shows how local the value of any particular stock may be. I should be very sorry to recommend its use, especially in the drier parts of Victoria.

The newer Berlandieri and Cordifolia hybrids have not been experimented with to any extent in these cold districts. These stocks are better suited for the warm south, as might be expected from their native habitat in Texas. However, I saw some vines grafted on Berlandieri x Riparia 420A in Switzerland which were doing very well indeed.

QUALITY OF WINE GROWN ON RESISTANT STOCKS.

This question is of importance, for it is only by strict attention to quality that we can hope for success in view of the keen competition existing in the wine markets of the world. There is perhaps no question concerning which opinions differ so much. Some authorities tell one that there are no more "*Grands Vins*" (wines of extra quality) produced in France. Others again, hold that the wine made from grafted vines is quite equal to anything that was ever produced before. Some even go so far as to say that the wines are now better than they were.

The fact of grafting seems to alter the constitution of the fruit somewhat. The berries are usually larger and the skin thinner. According to the season this may be an advantage or otherwise. In some parts it has led to alterations in wine-making methods. As regards the flavour of the fruit no alteration is caused. This might be expected from what happens in the case of other fruit. Pears grafted on quince stock, for example, produce fruit without any quince flavour.

So far as I can gather, the effects of grafting seem to be a general level line of quality. In a bad season the wine is probably improved, but not so in a good season. It may be the result of chance, but the fact remains that since the French vineyards have been reconstituted there do not appear to have been any vintages of extra special quality, such as used to be occasionally gathered in the old days. So far as body and colour are concerned the good vintages of recent years leave nothing to be desired. It is the perfume or "bouquet" of the wine which appears to have suffered to some slight extent, and this is the very quality to which French wine judges attach the greatest importance.

It is perhaps not altogether fair to blame the American vine and the fact of grafting for any loss of quality in recent French vintages. Other factors have no doubt contributed to this result. Reconstitution has necessitated great sacrifices. To recoup themselves growers have done all that science or art could suggest in order to increase their yields. The crops obtained now-a-days, owing to heavy manuring and intense culture, are considerably heavier than they were. New French viticulture is quite different to what it used to be, and I think it is to this forcing of the yield rather than to the fact of grafting that any loss of bouquet is really due.

As regards the heavy Burgundies which constitute the bulk of Australian shipments to London, I do not consider that we have anything to fear, and even as regards the more delicate lighter wines, what I have seen has quite reassured me. The wines I have tasted; both Burgundies and Beaujolais, grown on American stocks, have been sufficiently excellent to allay any fears which may have been raised by the gloomy opinions of some authorities with whom I have discussed the subject. When wines from grafted vines sell for as much as £80 a hogshead at three months old, as happened in Burgundy last year, it is evident that good wine can be made from resistant stocks.

It would appear that the wine yielded by a given variety grafted on one stock may be superior to that produced by the same variety grafted on a different stock. I have already mentioned the popularity of the Vialla on this account. As yet this side of the question has not received the attention one would expect. It seems that the greater the affinity existing between stock and scion, the more is the quality of the wine respected. Vitis Berlandieri and its hybrids, and some of the Franco-Americans, are considered to give great promise so far as the quality of the wine is

concerned. These stocks have so much to recommend them that their immediate introduction to Victoria is much to be desired.

Influence of Grafting on Table Grapes.

So far as I can see we have nothing to fear in this direction. I went exhaustively into the matter with a partner in one of the largest fruit firms in Paris, "Omer Decugis & Co." He has carefully studied the question, and has not noted any difference in the quality or carrying power of the fruit, though he has had abundant opportunities of comparing the fruit of the same varieties grafted on American stocks and growing on their own roots. The effect of certain stocks in causing the bunch to be closer or looser has already been referred to. The nature of the bunch should be borne in mind when grafting table grapes, and the stock selected accordingly. It would be unwise to graft a variety with a straggly bunch, such as the Raisin des Dames (or Bicane, as it is usually called in France) on the Rupestris du Lot, for example. A variety with too compact a bunch may, on the other hand, be improved by being grafted on this stock.

Reconstitution Methods.

A few notes concerning the more salient points in connexion with the raising of grafted resistant vines in the different parts of France and Switzerland I have visited may prove of interest. To describe nursery methods in full would entail a repetition of much that has already been published by the Department. It will be sufficient to here point out the more recent innovations.

Bench Grafting, or Grafting in the Vineyard.—The latter method, which was largely followed in the early days of French reconstitution, is now generally superseded by the planting of bench grafted vines struck in a nursery. The greater regularity of the resulting vineyard, and the possibility to use the soil for other crops for an extra year, are chief advantages. However, if the grafting be performed in a thoroughly expert manner, good results can be obtained by grafting in the vineyard. I have seen many very satisfactory vineyards reconstituted in this way, notably a property privately owned by one of the leading French viticultural authorities. Success depends upon the efficiency of the man who does the grafting. As one goes north, vineyard grafting is less and less practised, chiefly on account of the difficulty of protecting the young grafts from severe winter frosts. Vineyard grafting is of value in the case of several stocks which strike with difficulty, and which cannot therefore conveniently be bench grafted.

Mother Vines.—The most important point I have noted in connexion with these is the situation of the land on which they are grown. Rich low lying ground is to be avoided, and on no account should mother vines be irrigated. Leading French nurserymen attach great importance to this point. They have most of their wood grown for them by small vineyard owners, but they are most particular as to the land used. Wood grown on moist, low-lying or irrigated land is spongy and poor in reserve materials, and with it only a poor percentage of successful unions can be expected.

Nearly all the mother vines I have seen have been exceedingly short-pruned, on a level with, or slightly below the surface of the ground. The land is cultivated until the shoots spread to such an extent as to prevent further cultivation; the canes and leaves form a network completely covering the surface of the soil to a depth of a couple of feet. The vines are not trained or tied up in any way. At pruning time all shoots are cut

off flush with the old stock, which eventually swells into a sort of large inverted pear. This style of pruning, known in France as the "tête de Saule" (osier) system, is almost invariably practised. It prevailed in over nine-tenths of the fields of mother vines which I saw in France and Switzerland.

GRAFTING.—This is almost invariably done by hand. The whip tongue, or English cleft-graft is by far the most usual. Machines are scarcely ever employed now; not that any great objection is raised to their use, but it is held that they do not save any time. In order to do good work an exceedingly keen edge is required, which necessitates very frequent sharpening. To sharpen the blades of a grafting machine is a slower operation than the sharpening of the grafting knife, which is passed a few times, at frequent intervals, over the oil-stone on every grafter's bench. Most of the nurserymen I have questioned on the subject have tried machines, but have abandoned them, their expert grafters preferring the plain knife. Künde's grafting knife, of German manufacture, is very frequently used, though several French makes are also very good.

CALLUSING.—Callusing in sand, as is done at Rutherglen, is largely practised and gives excellent results. It is of late years, however, frequently replaced by callusing in moss. This is the method chiefly used by the large nurserymen of the south of France, who find it more convenient on a large scale than sand. Ordinary moss, such as florists use, was at first employed, but it was found difficult to secure a sufficient quantity. It was therefore replaced by what is known as "Mousee de mer" (sea-moss), a sort of fine sea-weed, which grows abundantly in the brackish lagoons which fringe the Mediterranean. This sea-weed is gathered during the summer previous to the grafting season, when it is required. It is spread out to dry, and also to have its surplus salt washed out by rain. This sea-weed gives excellent results. It is the substance employed for packing the young vines sent out by the nursery firms. This callusing in moss (so-called) enables the tying of the grafts to be dispensed with. On asking at Montpellier what knot was used to tie the grafts, I was astonished to learn that this operation has now been abandoned. The grafts are packed in cases, in small bundles, separated by layers of moist moss. These cases are placed in a room kept at a uniform temperature of about 70 deg. F., until properly callused. The cases are then taken bodily out to the nursery, and the grafts are planted in the ordinary way, but with a minimum of exposure to the weather and under excellent conditions for a successful strike. Where sand callusing is still practised—chiefly in central and eastern France and Switzerland—the grafts are tied with raffia as usual.

AFTER TREATMENT IN THE NURSERY.—This includes the usual cultural operations in order to keep the soil loose and to prevent the formation of a crust; the removal of scion roots and stock suckers; and irrigation. I was rather astonished at the amount of irrigation nurseries receive. Unless rain falls they are usually watered every fortnight or three weeks during the summer. Of course every watering must be followed by careful cultivation, so as to avoid the formation of a crust. This copious watering is considered necessary in order to insure a sufficient percentage. It does not appear to prejudice the resulting plants; at any rate it is very largely practised by the best nurserymen.

In the south of France few growers raise their own stock; as a rule they buy from nurserymen who make a speciality of this work. In central and eastern France many owners have their private nurseries and raise their own stock.

The removal of scion roots is very carefully carried out in the south of France, and is looked upon as a most indispensable operation. It is usually performed in June or early July. In Switzerland and eastern France this operation is performed rather later. Strange to say, in these parts the scions do not seem inclined to throw such strong roots as they do in the south.

An important point in connexion with grafted nursuries is the necessity to frequently change the land in which they are planted. It is not considered advisable to use the same land as a nursery for more than two or three years running. The best nurserymen usually lease their land for two, or at most three years, after which it is devoted to other cultures. After a few years it may again be used as a nursery. This change is necessary to guard against Pourridié or root-rot, which gives trouble if vines are repeatedly propagated on the same ground.

SUBSOILING.—Before leaving Australia, I was glad to note that intending planters were making arrangements for thorough and deep preliminary preparation of the soil. It is therefore unnecessary to repeat what has been so frequently urged. I must, however, briefly mention it lest silence on the point might lead some intending planters to discount its importance. All I have seen, especially in the warm south of France, has only further emphasized the importance of this work. No one thinks of planting without first thoroughly trenching. This operation is usually performed before the end of summer. It is found that the work at this season gives the best results. In France the ground is usually trenched, with a plough with a mould-board, and not subsoiled as we have found most satisfactory in Australia. The reasons which cause one or other of these methods to be preferred are local, and do not interfere with the principle of deep preparation.

DISTANCE APART OF GRAFTED VINES.—In the early days of reconstitution growers were advised to plant the grafted vines very far apart, on account of the greater vigour of the American stock. It has been found, however, that this was a mistake, and French growers, in most cases, now plant at the same distance apart as their fathers did. Each district has its particular distance, suited to local requirements. There seems to be no interest to alter this to any extent on account of the new conditions under which the vines are made to grow. Owing to the cost of the grafted vines growers may be tempted to plant farther apart. They must avoid being led into the mistake of too wide planting.

ALTERATIONS IN METHODS OF TRAINING.—These are not very considerable. Each district in France has to a great extent preserved its time-honoured method. The training of the vines on wire, however, has become common in a good many districts where it was not previously practised. The need to long-prune vines grafted on such stocks as Rupestris du Lot, in order to make them set their fruit, has largely contributed to the extension of the use of wire. A convenient method of training on wire, which obviates the need for tying up the vines in early summer, is employed in a good many places. Three wires are used, one wire is situated an inch or two above the crowns of the vines. To this wire, the rods or leaders, left at the winter pruning of the vine, are tied in the usual way. Some 15 inches higher two other wires are placed, on the same level, stapled to each side of each post. The growing shoots are merely passed between these parallel wires, and remain there without requiring to be tied.

THE USE OF RYE STRAW FOR TYING VINES.—This is very general in all districts where vines are tied up. In fact I scarcely saw raffia used

for this purpose anywhere in France or Switzerland. On one vineyard where raffia was employed I was informed that this was only because the stock of last year's rye straw had been destroyed by fire. I think this material could with advantage be used for tying up vines in Victoria. In Switzerland this straw is imported from parts of France where rye is cultivated. This year its market value was £5 12s. a ton.

GARDEN HERBS.

J. Cronin, Inspector, Vegetation Diseases Acts.

Plants embraced in the general terms of "pot herbs" and "sweet" herbs, are those whose foliage contains some aromatic principle useful in and incidental to cookery, the most important being perennial and herbaceous plants of easy cultivation. A few annual kinds are grown occasionally, but the herbs generally cultivated for home and market are sage, thyme, mint, savory, marjoram, and hyssop. The first-named is the most popular and generally grown. Large quantities of herbs are produced by market gardeners, several of whom devote most of their time and area to the cultivation of the plants. At all seasons of the year there is a demand for the produce. In spring and summer the herbs are sold in a fresh condition, while at other periods dry herbs only are available.

In market gardens herbs are usually grown in a portion specially reserved for their culture, a plan to be generally recommended even in very small gardens, as the plants occupy a given position for several years as a rule, and should be considered as outside of the rotation and ordinary culture of vegetable crops. A limited area well prepared and tended will produce a quantity of foliage of good quality sufficient for an ordinary household, while with a much greater quantity of plants scattered about the garden, more or less neglected, a shortage often occurs. It is generally understood that coarse growth is undesirable, the aromatic qualities peculiar to the various plants being present in a lesser degree in gross growths and leaves than those cut from steadily grown and well matured plants. Sufficient root-room, plant food and moisture should be provided to allow a full development of the plants.

The best plan to adopt for home gardens is to select a piece of ground of a size according to requirements, and devote it to herb culture. A narrow border alongside a fence or path is generally found suitable, but it must not be beside a hedge, or large trees, or the plants will suffer unless well manured and watered during summer. In many gardens the herb ground is tended as carefully as any other portion, and is usually neat and attractive, the plants being set out in rows and neatly trimmed as required, well cultivated and often margined with parsley or thyme. A few minutes' hoeing occasionally, or a mulch of manure is sufficient to keep most of the plants in steady growth, and a thorough soaking with water during exceptionally dry weather followed by cultivation when the surface is drying will insure a plenteous supply for the whole year in either a fresh or dried condition.

Thyme and Sage.—Thyme and sage are dwarf shrubs and are propagated from divisions of the old plants, cuttings, or seeds. As a rule the plants are divided and replanted every third year, the central portions being discarded and the outer and most vigorous shoots with roots attached being selected for replanting. Cuttings of firm shoots

inserted in sandy soil in autumn root readily, but do not produce as much foliage for cutting as divisions during the first season. Autumn is the proper season for dividing and replanting. Sage is often raised from seeds when the plants have become enfeebled by excessive cutting. The seeds germinate freely and a fresh stock of plants may be raised with little trouble. The seeds may be sown in autumn or spring, the former for preference. The young plants bear transplanting well, and may be removed at any time except mid-summer and mid-winter, without injury. The seedlings should be allowed to grow without much cutting of foliage during the first year. Mature plants may be cut several times in the season; a general cutting for drying for winter use is best done when the flowering shoots are showing. Excepting when wanted for seed-saving purposes, herbs grown for foliage should not be allowed to bloom. In all cases a few leaves should be allowed to remain on each shoot or branch when the plants are being cut in summer.

Hyssop.—Hyssop is almost identical in its needs with sage.

Mint, Marjoram, and Savory.—The herbaceous plants, mint, marjoram, and savory, are best planted adjacent, as they require slightly different treatment at times to the shrubs. The shoots of these die to the ground in winter, the roots remaining alive. They are propagated from divisions of the roots in autumn or from seeds. Mint is generally increased from divisions and requires a cooler and moister soil than the other herbs. It is a perfect weed in some places—a weed being defined as "a plant out of place"—while in dry hot situations it is often a matter of difficulty to establish it. In such places a liberal quantity of cow manure should be added to the soil and the plants mulched and watered until thoroughly established. *Shoots should be cut and dried as they approach the* flowering stage.

Sweet Marjoram and Sweet Savory are annuals and require to be sown annually. They should be sown in rows in spring and thinned to allow sufficient room for the plants to develop.

THE PROCLAIMED PLANTS OF VICTORIA.

(Continued from page 720, Vol. V.)

Alfred J. Ewart, D.Sc., Ph.D., F.L.S., Government Botanist; and
J. R. Tovey, Herbarium Assistant.

Apple of Sodom.

Solanum sodomæum, Linn. (*Solanaceæ.*)

A spreading or diffuse shrub or herb of one to three feet. Foliage green, but sprinkled as well as the branches with a few small star-shaped hairs. Prickles stout often thickened downwards on the stem and leaves, more slender on the calyces. Leaves deeply pinnatifid, with very blunt rounded, obovate, or spathulate, lobes, often wavy; the whole leaf three to six inches long. Flowers in small clusters on short and simple rarely once forked stems. Calyx divided to the middle into blunt lobes. Berries globular, rather large, variegated green and white, or finally yellow.

An introduction from Africa. Sometimes wrongly called Kangaroo Apple. It is a most obnoxious weed undoubtedly poisonous, and should be pulled up before the fruits mature, piled and burnt.

Proclaimed for the whole State, February, 1907.

GARDEN NOTES.

J. Cronin, Inspector, Vegetation Diseases Acts.

The Pentstemon.

The garden varieties of the pentstemon are valuable plants for flower beds and borders, as they grow freely with a moderate supply of moisture and plant food and bloom for several months of the year. The natural habitat of the genus is Central America, most of the species being natives of Mexico and California. The plants are of perennial herbaceous habit of growth, and during the growing season freely produce shoots that bear spike-like bunches of long tubular flowers of varied and bright colours. The original species are rarely cultivated now, the hybrid varieties being greatly superior in every way. A species occasionally seen in nursery and special herbaceous collections is *P. azurea*, the flowers of which, though small and few in comparison with the best hybrids, are of a beautiful shade of blue. This colour is absent in the garden varieties, and its introduction would add greatly to the value of the pentstemon. A number of new and improved varieties have been raised during the last few years. An Australian hybridist, Mr. G. H. Kerslake, of Sydney, has contributed several that are said to be a distinct advance on any that have been imported. The flowers are not difficult to cross-fertilize, and as the plants are easily raised from seeds and bloom early we may expect to see a greater advance in the near future, possibly—as has occurred with the chrysanthemum, dahlia, and other garden flowers—an Australian type of this plant.

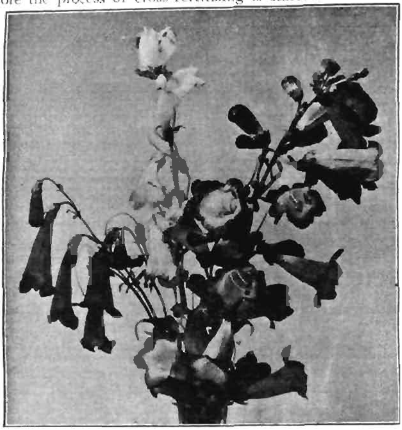
One of the principal factors in the value of the pentstemon as a plant suitable for general border culture is its extreme hardiness, the plants enduring a deal of drought and neglect without perishing. The blooms are produced freely during the hot summer months and with a little attention a good display is assured. The pentstemon is not a popular plant with florists who grow flowers for sale, for although the flowers last well when on the plants and are freely produced they are not lasting when cut in hot weather.

Soil and Culture.

Although the pentstemons will grow and thrive fairly in almost any garden soil they succeed best in a light loam that is well drained. The most common causes of failure are to plant them in wet sour soil, or within the excessive shade and soil starving influences of large trees. When planted in a fairly friable soil that has been moderately manured they will resist conditions severe enough to destroy many other garden plants. In very dry situations the plants generally grown in mixed borders will benefit largely by the addition of two or three inches of stable manure spread over the whole surface of the beds as a mulch; under such conditions the pentstemon will thrive. Mulching should be applied while the soil is in a moist condition in spring.

The pentstemon is propagated from cuttings, divisions and seeds. Cuttings taken in autumn from the shoots that occur on the stems root readily in sandy soil in a cool frame or sheltered situation. The young plants should be transferred to their flowering quarters early in spring. Old plants may be divided in autumn and replanted where they are to

grow. Seeds should be sown in early autumn or spring in light soil. They may be sown in boxes or pots or in a specially prepared patch of light well-tilled soil. When the young plants are large enough to handle they should be potted or grown on in boxes until strong enough to plant in the borders. Snails and slugs should be prevented from attacking the young plants. Seeds can be obtained from the various seedsmen or the grower can save his or her own; the finest varieties only should be selected to save seeds from and the flowers should be fertilized. Any indifferent varieties, especially those bearing purplish coloured flowers, should be cut down before the process of cross-fertilizing is started.



TYPICAL PENTSTEMON SEEDLINGS.

A number of varieties of pentstemon are catalogued by nurserymen. The following are a few of the best:—Alba, White Beauty, Perle, Stanstead Rival, Georges Sand, Sculpteur Bartholdi, Bertha Koch, Cratere, Kamm, Neron, Jupiter, Diane, Emblem, Gaulois, Lamartine.

Flower Garden.

The importance of a proper preparation of the soil prior to planting is apparent at this season of the year. In gardens where the beds and borders have been deeply worked, drained, and manured, the plants generally grow satisfactorily without watering, while in poor and shallow soils frequent soakings of water are necessary to keep them alive, although the natural conditions are practically identical. The most important task at present is the maintenance of coolness and moisture in the soil, combined with healthy foliage on the plants. Watering, mulching, and cultivating are means to promote the former, while materially assisting the latter.

A number of pests ravage plants of various classes during summer; among the worst is red spider, which is most destructive in its effect on dahlias, roses, and other genera. The attacks of red spider can be prevented in a measure by the removal and destruction of badly infested subjects, such as pansies that have produced their best flowers, and by exercising discretion in planting or sowing seeds of plants of minor value that are liable to be attacked, in proximity to the more important plants. Red spider is one of the most difficult garden pests to exterminate when established, especially in dry districts where the soil is of a sandy nature and is almost certain to infest French beans, peas, and many other plants that have reached maturity. The leaves of gladioli are also hosts for this pest, especially when ripening, and should be sprayed with a strong soap solution or cut away and burned. Plants allowed to become dry at the roots are very liable to attack. Caterpillars of various moths also attack the foliage and flowers of several important garden plants, in many cases damaging the foliage extensively before it is unfolded. When the leaves at the growing point are "rolled" by the caterpillars the only means to destroy them is to pinch the shoots. Spraying the plants with Paris Green mixed with lime water at rate of 1 oz. to 10 gallons will destroy any caterpillars feeding on the surfaces of the sprayed plants. Unslaked lime only should be used in preparing the lime water, from ½ lb. to 1 lb. being sufficient for 10 gallons. The mixture should be constantly agitated, while being applied in the form of a light mist-like spray, which should reach all parts of the plant to be thoroughly effective.

Cannas, perennial phloxes, and other herbaceous genera will require to be watered during dry weather to bring the flowers to perfection. Where the soil has been mulched one good watering is generally sufficient, and in any case sufficient should be applied to saturate the area occupied by the roots. Plants clothed with dust should receive a sprinkling overhead to cleanse them. Evening is the proper time for the application, as light overhead sprinklings in hot sunshine are likely to injure delicate foliage.

Annuals that have finished blooming should be removed and the soil prepared for other plants to fill the vacancies, observing rotation as far as possible. Winter and spring flowering bulbs are a good succession to annuals, such as stocks, phlox Drummondi, and others.

During this month seeds of a number of annuals and perennial plants may be sown for transplanting in autumn. In any garden, a portion, even if small, should be reserved as a nursery for raising plants from seeds and cuttings. The important considerations are shelter and a supply of water. In a very limited nursery a quantity of plants can be raised annually if a frame or screen over beds or boxes for raising the plants is provided. The main advantage of sowing seeds in summer is that the plants are ready to set out early in autumn, and make considerable progress before the cold weather sets in. Pansies and Iceland poppies for example raised early commence to bloom in July and develop into strong plants that will continue to flower well with a little attention until Christmas. In the dry and warm parts of the State they are generally pest-ridden and it is better to destroy than to attempt to clean them. The soil for seed beds and boxes should be light and porous, and should be firmly pressed or trodden and levelled before sowing the seeds, which should be done thinly and evenly. The seeds should be covered with sifted soil

and the surface gently watered. The young plants appear during the hottest part of the year, and will require to be shaded during hot sunshine and watered regularly to survive, it being necessary to water two or three times a day during dry and very hot weather.

The growing shoots of chrysanthemums should be carefully watched at present to prevent caterpillars damaging them. Early next month the crown buds appear, and if deferred or damaged by grubs, as they are generally termed, the blooms are, in many cases, inferior. The growths need regular examination and should be tied to stakes as they develop; all lateral shoots should be removed. No buds should be saved this month except in special cases where it is known that the best flowers are produced *on early crown buds*. Carnation plants may be layered, by which means a stock of young plants may be available for planting in from four to six weeks. The shoots should be "tongued" on the under side, fixed firmly, and covered with light soil (sandy, if possible) after the reception of the cut portion of the shoot. The layers will need an occasional watering during dry weather. This method of propagation is practised by nurserymen for increasing shrubs that fail to strike readily from cuttings. It is a method by which the amateur gardener may increase many plants, otherwise difficult to propagate, without much trouble. Daphne, eriostemon, and other shrubs are commonly increased by this means, and the principle can be applied to a number of shy-rooting kinds.

Kitchen Garden.

At this season of the year little can be done beyond keeping the ground in good condition by frequent light cultivating and by watering. *No deep cultivation should be attempted among growing crops, a light hoeing* or scarifying for moisture conservation being all that is necessary. As soon as crops are gathered the rubbish should be cleared off, and either burned or mixed in a compost heap containing fresh manure to destroy any insects present, and the ground should be broken up and manured to receive other crops. Advantage should be taken of a cool or moist change to plant out celery and other plants from former sowings. Seeds of various saladings for succession may be sown, also peas, French beans, cauliflower (at end of the month), and root crops for use in autumn and early winter. Sets of early varieties of potatoes may be planted for an autumn crop.

THE RABBIT PEST.

At the request of the Executive Committee of the Chamber of Agriculture, the various Agricultural Societies throughout the State have been asked to collect all available information from progressive local residents as to the means they have found most effective in dealing with the rabbit pest. *Journal* readers whose properties have been infested are requested to communicate with the Secretary of the nearest Society on the subject. Particulars relative to results of poisons used and the methods of preparing and laying same will be of value.

The information will be collated by the Societies and forwarded to the Department for subsequent publication.

IRRIGATION METHODS.

A. S. Kenyon, C.E., Engineer for Agriculture.

A correspondent writes asking for some notes on the amount of water necessary for the growth of different crops, the best means of applying the water, the number of applications and the periods of the year for watering. This makes too much of a demand upon the limited space available for "Answers to Correspondents" so that the reply is given here in the ordinary pages of the *Journal* as being of general interest.

In the first place, the volumes of water required for the full growth of various crops will vary much. Water is directly required by plants for transpiration or evaporation through the surfaces of their leaves, consequently the amount of foliage is an important factor, and for the formation of their actual bulk, of which water is a large constituent, running, in some cases, over 90 per cent.; but its greatest service is in dissolving and thus rendering available, the plant foods contained in the soil. In many parts of the State, winter crops get sufficient moisture from the heavens for all their requirements, at any rate with proper cultivation, while the same may be said to a less degree of summer crops. The latter may be successfully grown, without artificial aid in watering, over large areas where they are at present either whole or partial failures, by the adoption of improved methods which are, in general, sowing in drills sufficiently wide apart to permit of cultivation and, especially after rains, the frequent use of the horse hoe or scuffler, between them. But in other localities—over the greater part of our Northern districts—winter crops require additional moisture in many, nay, most years, and the summer crops always. The supply of these requirements is met by irrigation which may be derived from public works under the State Rivers and Water Supply Commission or from private sources, such as pumping plants or by the construction of dams. It is well to bear in mind that by the Water Act 1905, the water in all rivers, creeks, lakes, lagoons, or marshes, even if wholly on private land, is the property of the Crown and can only be used lawfully for irrigation under the authority of the Commission. True, riparian owners are entitled to the free irrigation of 3 acres; but only in direct connexion with a homestead or for its service so that the exception is only trifling. Licences to divert water from any source may be obtained on reasonable terms and give a much desired security of tenure.

Having obtained the water, care must be taken in applying to the ground so as to make a thorough job of it. Mere soaking of the top few inches only means early loss by evaporation with but little water reaching the subsoil to be there stored for future use. Surface roots are encouraged and a brief stimulus given the plant, too soon to be lost. As water cannot be forced into the ground, sufficient time must be allowed for it to soak in and penetrate to a reasonable depth. The time necessary may be as little as 14 hours but will generally amount to 24 or over. The volume of water necessary will depend upon the character of the soil and upon the method of distributing adopted; the rooting character of the plant will also be a factor, tomatoes and lucerne for instance requiring very different volumes. The volume may vary from 3 inches or under to as much as 20 inches in depth over the whole surafce. The most usual depth is found to be about 7 inches. One inch in depth over a surface of one acre is equivalent to 23,000 gallons or 3,630 cubic feet.

The best means of distributing the water so as to reach the plant's roots, is undoubtedly by underground perforated pipes; but this is a very

costly method and one not likely to be brought into use here for some time to come. The next best is by distributing furrows. The furrows are ploughed out by the ordinary garden or orchard plough and generally along the line of fall, the plants being sown in drills to suit. The distance apart of the furrows depends upon the nature of the soil; but six to eight feet may be taken as the furthest and three feet as the more general. For fruit trees, only two furrows are used for the first two years, one on each side of the row. Later as the root system increases, four or five furrows in each, depending upon the distance apart of the trees, are adopted. The water is let into the furrows from a head ditch or distributary channel by outlets made of iron pipes, wooden boxes or simply shovel cuts secured from washing out by wisps of straw or grass. Largely the amount let out to each furrow must be determined by experience and "rule-of-thumb" methods. The length of the furrows varies with the nature of the soil,

WATERING YOUNG TREES, WYUNA IRRIGATION FARM.

the slope and the natural features; they should rarely exceed ten chains in length and are more generally about five. Sufficient flow should be allowed into each to just reach the lower end after thoroughly soaking the ground on the way. As soon after each watering as the state of the soil will permit, the scuffler or harrows should be run over the surface to form an earth mulch to retain the moisture. Cultivation as soon as possible after watering, is not only essential for the furrow method but for all the systems.

The corrugation or permanent furrow is the next way of distributing the irrigation water. For lucerne, the greatest of the fodder crops, this system is eminently suitable, it being perennial and profiting by frequent watering. In this system, the plant is grown along low ridges and the shallow hollows or depressions between are used for distributing the water much the same way as for furrows. After cultivation is, of course, essential, care being taken to preserve the shape of the corrugations.

Owing to the permanent character of the furrows, watering is much simpler and more certain. Once in working order and the irrigator familiar with his ground and its requirements, water may be turned on into the head-ditches and allowed to distribute itself, saving a lot of labour and annoyance.

In the spreading system, distributary channels are run along contours, that is on lines of the same level, at distances of several chains apart. The water is let out from a distributary by any of the means already described and at frequent intervals; it is allowed to flow slowly over the surface to the next contour channel which picks up any surplus. When well arranged, the result should be the same as in the furrows, very little reaching the end beyond that required to soak the soil in the immediate vicinity. If the land has been well graded and levelled, this is a fairly simple operation and the water will need but little coaxing or blocking

SPREADING SYSTEM OF WATERING LUCERNE AFTER HARVESTING COVER CROP, WYUNA IRRIGATION FARM.

with the long-handled shovel to spread over the whole surface between the contour drains. Plenty of labour at the outset in land preparation and efficient system will tend to greatly reduce the labour required in distributing and as the latter is a continuous expense, no pains should be spared to reduce it to its lowest limits compatible with good work.

The flooding or check system comes next in order of merit. Check banks which are advisably made low and wide so that implements may be worked over them, and at intervals to allow of six inches in depth of water at most being put on the land. In somewhat undulating country the check banks may be with advantage run on the contours, each being four inches lower than the previous one. When flooded in a check the result will then be two inches in depth at the upper end and six inches at the lower, the water being about flush with the top of the check bank.

With the section generally adopted, narrow and high, there is a considerable liability to break away causing loss of water and damage to crops. If the ground is tolerably level, the check banks may be run in straight lines, to suit cultivation and harvesting, enclosing from five to ten acres in each check. This brings the description of distributing systems to a conclusion, for the letting of water on to a paddock to find its way as best it can over the surface forming islands and leaving pools is not a system, though unfortunately only too common in practice. Too much stress cannot be laid upon the three cardinal requirements for successful irrigation: preliminary grading or levelling of the land to be watered; allowing sufficient time for thorough soaking; and surface stirring as early as possible after watering.

In all cases, see that the seed bed is moist. Land may be watered before ploughing or after; but the moist seed bed is essential. It may, of course, be due to natural causes without any watering. For winter crops, the next watering depends upon the season. It may not be needed until late in September and sometimes not at all. A third watering is but rarely called for. For summer crops water seed beds as before, then give another watering about a fortnight after sprouting and a third in another four weeks or so as the season requires. This should be sufficient to give a full and mature growth. In the case of lucerne, a watering should be given immediately after each cutting, and then get to work with the harrows. This with favorable conditions may mean that five or even more waterings may be needed. For fruit trees, four waterings at most will do, save in exceptional seasons, and vines can do with one less. Crops of the market garden order will probably require more frequent attention; but as they will, in general, be of small extent only, they can be sufficiently satisfactorily dealt with. If supplies are drawn from a public channel provision will need be made to store some water for this purpose as the channel will, in all probability, be empty for longer intervals than the plants will stand. Tanks are cheaply constructed and with a pump available, the spoil may be used to form a basin above the level from which the water may be gravitated as required.

The above notes will serve as a general answer to the queries given at the head of this article, but it is well to remember that only broad principles can be given the cultivator on paper. The irrigator himself must solve most of the problems—and they will not be few—that will arise. Hired labour will seldom be satisfactory. The successful irrigator will always be the small holder who can give his personal attention to a small area and work it thoroughly. As for the larger holders, profits are to be made even with the rougher and cheaper methods of distribution; but not to the extent possible with the smaller man.

As a parting word, never let the water touch the stems of growing plants in hot weather; else you run serious risk of injury to the plant. As to results to be aimed at, if fruit growing is the selected way, little improvement is possible upon the existing methods of cultivation and watering in vogue at Mildura and in the Goulburn Valley. If fodder and its conversion into animal products per medium of the cow or the sheep, is chosen, then use all endeavours to get a good stand of lucerne. Do not graze but cut it and hand feed; and prepare to plough it out at intervals of from five to eight years and re-sow after an interval of other crops.

FUNGUSINE AS A SMUT PREVENTIVE.

D. McAlpine, Vegetable Pathologist.

A sample of the powder known as "Fungusine" was purchased from the National Cattle Food Co. in order to test its efficacy in preventing Smut. According to the description accompanying the packet it is "The infallible seed protector for pickling wheat, barley, oats and other grains and seeds before sowing. A sure preventive of Smut, Rust, Take-all, Wireworm, and all fungoid diseases. Superior to bluestone, formalin or any other known dressing." If it possessed all these virtues claimed for it, then it would be one of the greatest boons ever offered to the farmer, and even if it could be relied on for the prevention of smut alone, it would still be worthy of general use. This one quality of smut prevention was chosen as a test, because it could be comparatively easily done and the results could be compared with that of other dressings previously experimented with.

It must be remembered that there are various smuts attacking cereals, some of which may be prevented by the use of bluestone and formalin and others not; but as this preparation was said to be superior to either of these fungicides, it was considered the fairest course to deal with a common smut which had already proved amenable to treatment and therefore comparable with this new treatment. Accordingly the Stinking smut or Ball smut was chosen for trial and the seed-wheat to be used in the experiment was infected with the spores of this fungus. One portion of this infected seed-wheat was treated with Fungusine according to the instructions laid down and another portion was left untreated. A piece of land was selected at Wilby which had been under wheat the previous season and the treated and untreated seed sown with the drill just as in ordinary farm practice. There were two strips of each, the width of the drill, sown alongside of each other.

The usual time of sowing in this district is April, but on account of the deficient rainfall the ground was rather dry then. Over three inches of rain fell in the months of May and June and as this improved the seed-bed, the plots were drilled in on 16th July. Although there were only 11.42 inches of rain for the year up to 10th December when the crop was ready for stripping, there was a fair crop even though the straw was short. A portion of the same paddock was used for experimental plots of wheat, but except where the seed was infected, no Bunt appeared in either the treated or untreated plots.

In order to determine the average amount of Stinking smut in each of the plots, a square patch was cut in each and the number of diseased and healthy ears carefully counted, the result agreeing perfectly with a count made of healthy and diseased ears in several rows. As the result of this determination there was 81 per cent. of Bunt in the untreated plot and in the plot treated with Fungusine there was only 7.8 per cent. There was thus a considerable reduction of stinking smut in the treated plot, but it is necessary to consider how the results of the treatment compared with those from the use of bluestone and formalin respectively.

In comparing this treatment with that of bluestone and formalin there are previous experiments to fall back upon. In the *Journal of Agriculture* for July 1903, the results of Stinking smut experiments conducted at Port

Fairy are given in which the three substances—bluestone, corrosive sublimate, and formalin—were tried. The seed-wheat was sown in strips with the ordinary farm-drill as in the present experiment and when the crop was fully ripe it was found that there were 91 per cent. of smutty ears in the untreated plot, and $\frac{1}{12}$, $\frac{1}{7}$, and $\frac{1}{3}$-$\frac{1}{4}$ per cent in the plots treated respectively with bluestone, corrosive sublimate and formalin. Bluestone was used at the rate of 1 lb. to 5 gallons of water, corrosive sublimate at the rate of 1 lb. to 100 gallons and formalin at the rate of 1 lb. to 100 gallons; although in regard to the latter it was afterwards found that the efficiency was increased by using a stronger solution, such as 1 lb. of Schering's formalin in 40 gallons of water.

We are now in a position to compare the relative effects of fungusine, bluestone, formalin and corrosive sublimate, when used as a dressing for bunt-infected seed and it will be necessary for purposes of comparison to fix the numerical relation between the effect of treatment with a particular substance and that of untreated seed. Thus in the case of Fungusine, there was 81 per cent. of bunt in the check plot and 7.8 per cent. in the treated plot, so that if the one is divided by the other it gives the numerical relation between the two and fixes a standard of comparison $\frac{81}{7.8} = 10.4$ and this number represents the factor or *co-efficient of efficiency* for Fungusine. If the other treatments are dealt with in the same way then the following Table is the result:—

CO-EFFICIENTS OF EFFICIENCY.

Bluestone	1104
Corrosive sublimate... ...	666
Formalin (1lb. to 100 gallons) ...	333
Fungusine	10·4

According to this Table, bluestone is over 100 times more effective than Fungusine in the prevention of Bunt and even formalin when used at less than half its usual strength is over 30 times more effective.

Looking at it from the simplest point of view as that of a smut preventive, Fungusine is neither efficacious enough for the ordinary demands of the farmer and miller, nor is it superior but rather far inferior to both bluestone and formalin.

The following is an analysis of Fungusine by Mr. W. Percy Wilkinson, Acting Chemist for Agriculture:—

	Per cent.
Iron and Alumina oxide	1.84
Calcium oxide	46.52
Magnesium oxide	6 43
Sulphuric anhydride	2.58
Carbonic anhydride	5.96
Phosphoric anhydride	Trace
Silica	16.78
Arsenious anhydride	5 03
Phenol	2.62
Tar oil	.57
Moisture	11.67
	100 00

The substance consists principally of ordinary burnt lime, white arsenic and crude phenyl.

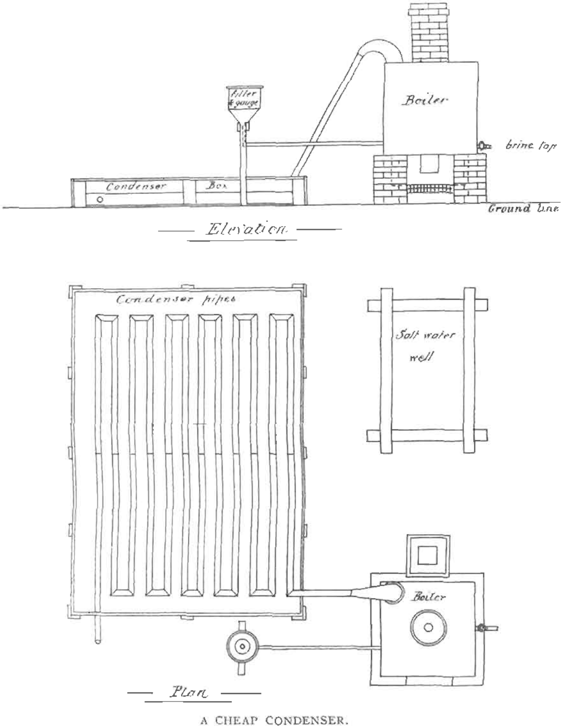
A CHEAP CONDENSER.

A. S. Kenyon, C.E., Engineer for Agriculture.

Although the experiments on which this article is based were made some five years ago yet we have been so fortunate in our seasons since that there has been so far no opportune moment for their publication. It would have been much more pleasant to be able to keep this matter still in hand; but to the almost complete absence of tank filling rains during the past winter and spring is due unfortunately something approaching a water famine in the far interior of the Mallee Country. Advantage has been taken of the good years to so extensively enlarge the distribution schemes of water supply serving the Mallee fringe that there are practically no blocks beyond a reasonable distance from water. Still there are settlers in beyond the fringe and there is a good deal of fine grazing country which might be utilized if water were available.

In most parts of the Mallee, water can be obtained by sinking to depths generally under 100 feet; but as a rule it is too salt for stock consumption. I am unable to say definitely what is the limit of total solids before the water becomes unfit for use. Sea water contains roughly 5 ounces of salt and other depositing matters per gallon. This is certainly too much; but stock have apparently thriven when feed was plentiful, where the water was holding considerably over one ounce per gallon. Food appears to be an influencing factor; but in any case it is surprising what inferior water stock and even man may be trained to. Still in many cases the water will be too salt even for our hardy stock to tackle. Then condensation is the only remedy. Condensation has a bad name as many attempts to condense salt supplies have proved costly and inefficient. This need not be so. Hereunder is given a description by Mr. J. Middleton, Mechanical Engineer, of the Public Works Department, of a cheap outfit designed by him for the use of Mallee farmers. This plant was erected by Mr. J. Sutherland, of Tyrrell West, whose property is about 20 miles from Sea Lake and some few miles west of the northern extremity of Lake Tyrrell, a vast expanse of white salt in summer and a sheet of salt water a few inches in depth in winter. Mr. Sutherland had struck salt water, too salt for stock, in large supply at a depth of about 70 feet. There was at the same time fresh water available at a distance of a little over five miles by a good track in a tank at Daytrap on the northern shore of the Lake. The actual experience gained from working was that condensing was more economical than carting that distance. This was a rather surprising result as it was previously considered that carting, where possible, was cheaper than condensing up to a limit of at least ten, and probably fifteen miles. The condensing took up the time of one man, drawing water from the well by windlass—no windmill being available—cutting firewood and attending to the fire, the boiler and the condensing pipes. The work was not laborious though the hours were necessarily long. On the other side there is a full team of horses—who themselves require much water—and a man occupied for most of the day for about the same net result as far as regards water. The man condensing can turn out between three and four hundred gallons per day, while the team can cart, allowing for its own consumption, not much over five hundred. On this experience, the settler contemplating condensing may estimate for himself its comparative economy. A horse will when working consume as

much as 25 gallons per day in hot weather so that a team of four will require about 100 gallons. Sheep will do with one gallon and cows with eight to ten.



A CHEAP CONDENSER.

In order to determine the amount of solids in the water, a hydrometer may be purchased or one may be readily contrived by an ingenious man. The principle is a bulb of large diameter with a long tube of small diameter; the whole floating with the bulb completely immersed and weighted so as to float upright. A small tin, baking powder or other, soldered up tight with a tin tube soldered on will serve. It should be

weighted so that it stands upright with the tube almost immersed when put in pure water. Then salt may be added to the water in instalments at the rate of say 1 oz. per gallon until a limit of 15 oz. per gallon is reached. As the salt is added and dissolved, the hydrometer will rise; a mark should be made on the tube at each point. If properly done, the hydrometer will show at a glance by the markings the amount of dissolved solids in any sample of water into which it is placed. One gallon of fresh water weighs exactly ten pounds. This is important as the operator must be able to ascertain when the liquid in the boiler has become so concentrated as to have 15 ounces per gallon dissolved in it, as beyond that density the salt or other solid matter will commence to deposit. The following is an analysis of a typical brackish water from a well in the Mallee :—

Total solids per gallon ...	... 600 grains
of which ...	... 473 grains are common salt.

In this case, the amount of salt and solids present would be generally considered too high for stock purposes, though it is quite possible sheep would become accustomed to it. As there are 437½ grains in an ounce, the sample quoted has about one and one-third ounces to the gallon, consequently it may be concentrated about 11 times, or in other words, 11 gallons of the saltwater should yield close upon 10 gallons of condensed water, leaving 1 gallon of concentrated 15-ounce liquid. If a hydrometer were made as described, it would have shown in the stem, approximately, one and one-third ounces to the gallon in the above sample. When the liquid shows nearly 15 ounces of solids to the gallon, it should be run off and the boiler refilled, or a considerable portion taken out and replaced by the original salt water. Attempts were made to air condense, dispensing with the water bath for the down pipes; but it proved a complete failure. Even on a cold night with strong winds, the results were only about 3 gallons per hour though something like 30 were being evaporated.

DESCRIPTION OF CONDENSER AS ILLUSTRATED.

The condenser consists of a 400-gallon tank used as the boiler, set on a brickwork foundation with a fire grate. The vapour from the boiling water is conveyed from the top of the boiler by a bell-mouthed bend and then through about 150 feet of 2½-inch down-pipe, which is laid in a box kept filled with salt water. All joints of the piping must be made steam and water tight. The vapour passing through them is condensed into fresh water before reaching the end of the pipe projecting through the side of the box and is caught in any suitable receptacle. The condenser box is made from 1⅛-inch T. and G. flooring boards. A brine cock is fitted to the boiler to draw off the concentrated brine. A filler, which also serves as a water gauge showing how much water is in the boiler, is fitted to it with a pipe connexion. The materials for the above will cost about £15 in Melbourne. The plant will yield about 30 gallons of condensed water per hour.

A system for a continuous supply and on a somewhat larger scale may be readily grasped from the following description. There is a windmill, pump, and elevated storage tanks as well as a fresh-water tank. The boiler is 8 feet long by 4 feet and may be either circular or square. It is set in brickwork. The condenser box is as before; but is elevated and has wrought-iron condensing pipes instead of the 18-gauge galvanized

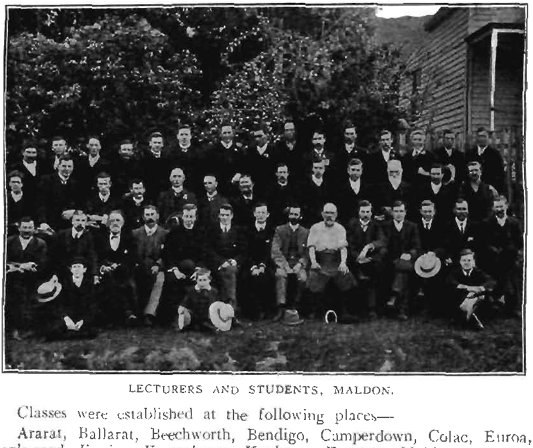
down piping. The condensed water flows into the fresh-water tank. The salt water runs continuously into the boiler, and an outflow may be arranged so that practically no attention to the boiler will be required. The cost including windmill would be about £100 in Melbourne, and it would condense some 60 gallons per hour.

AGRICULTURAL EDUCATION.

REPORT ON CLASSES HELD DURING 1907.

H. V. Hawkins, Superintending Officer.

It is now five years since the Short Course Classes for farmers and others were inaugurated, commencing with 3 centres only. The demand for classes grew apace, and the number of centres has increased to 27. As evidence that the farming community highly appreciates the instruction given, it may be mentioned that many districts where classes have been held have continued to invite the lecturing staff, and the Department has been reluctantly compelled to refuse some applications, in order that other districts might have equal opportunities with those favoured in former years.



LECTURERS AND STUDENTS, MALDON.

Classes were established at the following places—

Ararat, Ballarat, Beechworth, Bendigo, Camperdown, Colac, Euroa, Inglewood, Kaniva, Korumburra, Kyabram, Kyneton, Maldon, Mildura, Moorabbin, Penshurst, Redesdale, Sea Lake, Seymour, St. Arnaud, Stawell, Swan Hill, Terang, Traralgon, Tungamah, Warragul, Yarram.

The total number of students who attended was 1,236, and the actual attendances, inclusive of visitors, were 16,389 representing a very considerable increase over all previous records.

The past year's work, spread as it was over a wider area than has been covered in any other year, brought the lecturing staff practically to the door of the farmer; and the classes were remarkable both for the

LECTURERS AND STUDENTS, MILDURA.

large attendances and the great interest displayed throughout. The outstanding features of the work carried out were undoubtedly the actual demonstration of the instruction given, and the keen appreciation of it by the students. This was noticeable in all sections but particularly in the case of Cultivation Methods, Veterinary, Sheep, Wool Classing, Dairying,

POULTRY YARDS OF A COLAC STUDENT.

Poultry, and Farriery subjects. The desirableness of this practical work has been recognised and given in previous years, though not to the same extent as in 1907. In one instance at least, Wool Classing, it has

already proved its value, certain students of previous classes having been engaged at a good remuneration to visit neighbouring farmers to class their wool. Another good effect of this is that the older generation of producers is beginning to realize that the education offered by the Department is of use to them. Other instances of the importance of practical demonstrations to the students can be cited, such as the selection of dairying breeds and types on the farms visited with the students; and similarly in the case of poultry, when the suitability or otherwise of locality, of breeds and of the general equipment can be pointed out. In this connection it is gratifying to note the success which attended the maize-growing experiments by boys under 18 in the Colac district, an account of which appeared in the April issue of the *Journal*. There is no doubt that the practical demonstrations appeal more forcibly to the mind of the farmer than any amount of theoretical training. Valuable as the latter is, it must be recognised that to achieve the best results it should be accompanied by the practical work.

The following table gives an analysis of the attendance and results of examination for each centre. The visitors have been included in the gross attendance:—

Centre.	Number of Students Enrolled.	Average Daily Attendance.	Attendance.	Number of Examined Papers.	Percentage of Marks gained by each Centre.
Ararat ..	85	53	991	24	58.62
Ballarat ..	120	72	959	82	45.13
Beechworth ..	78	39	578	32	51.34
Bendigo ..	61	50	726	17	65.22
Camperdown ..	85	44	660	20	44.00
Colac ..	80	44	471	18	31.47
Euroa ..	59	43	969	66	51.49
Inglewood ..	123	46	796	41	28.81
Kaniva ..	89	66	806	67	45.43
Korumburra ..	62	28	452	32	51.83
Kyabram ..	41	27	473	26	57.14
Kyneton ..	43	23	358	26	42.70
Maldon ..	79	64	832	32	36.52
Mildura ..	96	45	768	28	57.66
Moorabbin ..	69	37	448	43	49.37
Penshurst ..	66	31	379	13	54.35
Redesdale ..	90	85	983	36	46.30
Sea Lake ..	75	34	392	40	47.43
Seymour ..	97	46	533	43	31.21
St. Arnaud ..	157	55	669	29	49.27
Stawell ..	62	28	632	36	46.07
Swan Hill ..	45	34	405	25	39.46
Terang ..	33	11	83	Nil	Nil
Traralgon ..	61	44	762	80	47.18
Tungamah ..	103	42	685	50	49.32
Warragul ..	37	10	229	28	59.38
Yarram ..	74	35	551	42	50.00

The Lecturers were as follow:—

Mr. F. E. Lee ... ... Mr. W. J. Colebatch, B.Sc., M.R.C.V.S. Mr. T. A. J. Smith	Cultivation.
Mr. R. T. Archer	Dairying.

Mr. H. Haile	...	Wool Classing.
Mr. H. W. Ham	...	Sheep Breeding.
Dr. A. A. Brown	...	Sheep Ailments.
Mr. L. L. Patterson, G.M.V.C.	... }	Veterinary Science.
Mr. C. D. Strong, G.M.V.C.	... }	
Mr. A. S. Kenyon, C.E.	...	Agricultural Surveying.
Mr. H. V. Hawkins	...	Poultry Breeding and Management.
Mr. C. B. Luffmann	... }	Orchard Work.
Mr. J. Cronin	... }	
Mr. W. Kenneally	...	Demonstrator in Farriery.

Examination papers were set by Dr. Brown and Messrs. Colebatch, Cronin, Archer, Haile, Ham, Hawkins, Kenyon, Lee, Paterson, Smith, and Strong. At each centre four examinations were held, a half-hour being allowed for each subject. Regarded merely as a test of how the instruction had been received, the results are very satisfactory and are an indication that the majority of the students possess a good general knowledge of the leading features of each subject.

The following are the detailed results for each centre. It is to be noted that the percentage of maximum marks is based on the maximum for the four subjects combined, which, of course, adversely affects the averages of those students who did not compete in all four subjects

ARARAT.

Student's Name.	Smith.	Haile.	Paterson.	Hawkins.	Total.	Percentage.
Pawsey, C.	90	95	65	90	340	85.0
Lewis, J. A.	52	90	70	97	309	77.7
Dalkin, H.	85	93	50	78	306	76.5
McCarthy, P.	69	53	68	97	287	71.7
Moran, J. J.	83	90	..	..	173	43.2
McLeod, J.	90	83	..	..	173	43.2
Roxburgh, D.	54	85	..	..	139	37.7
Byrne, E. P.	66	70	..	..	136	34.0

BEECHWORTH.

Student's Name.	Smith.	Archer.	Paterson.	Cronin.	Total.	Percentage.
Johnson, E. R.	95	97	80	100	372	93.0
Hayes, Jas.	90	98	75	93	356	89.0
Thompson, G. W.	80	94	58	91	323	80.7
Pulling, A. A.	22	95	50	96	263	65.7
Carnsew, G.	63	75	35	83	256	64.0
Le Couteur, F.	73	93	45	..	211	52.7
Nammon, J.	57	68	..	..	125	31.2
Sutherland, Neil	24	58	..	25	107	26.7
Bolle, W. H.	..	..	..	88	88	22.0
Payne, W. E.	..	84	..	..	84	21.0
Dyring, L.	30	45	..	..	75	18.7

BALLARAT.

Student's Name.	Lee.	Archer.	Strong.	Hawkins.	Total.	Percentage.
Reid, W. R. ..	77	98	70	90	335	83.7
Webb, H. R.	74	97	55	80	306	76.5
Brazenor, J. A. S. ..	75	96	40	90	301	75.2
Smith, E. J.	72	85	45	80	282	70.5
Wardle, H. V.	71	89	45	60	265	66.2
Vale, K.	71	98	..	92	261	65.2
Bowes, J.	71	89	15	65	240	60.0
Nicholls, W. K.	75	70	..	85	230	57.5
Caldwell, R.	75	75	20	60	230	57.5
Strange, E.	40	65	60	45	210	52.5
Ogilvie, E.	40	98	..	70	208	52.0
Errey, Wm.	70	98	..	..	168	42.0
Baird, A.	75	91	..	..	166	41.5
Treloar, H.	..	..	75	90	165	41.2
Lambert, H.	75	88	..	..	163	40.7
Fenton, J. T.	65	97	..	..	162	40.5
Tuthill, F. H.	60	97	..	..	157	39.2
Greenfield, A. W.	50	100	..	..	150	37.5
Bennett, G.	51	96	..	..	147	36.7
Greenwood, L.	..	25	35	85	145	36.2
Baxter, D.	61	83	..	..	144	36.0
Liddiard, E. J.	50	93	..	..	143	35.7
Payneter, B.	50	90	..	..	140	35.0
Day, Geo.	80	60	..	..	140	35.0
Rose, W. W.	65	71	..	..	136	34.0
Allen, G.	55	78	..	..	133	33.2
Revel, J.	50	75	..	..	125	31.0
Punshow, Mrs.	41	80	..	..	121	30.2
White, G. P.	50	65	..	..	115	28.7
Punshow, G. F.	21	80	..	..	101	25.2
Page, J. G.	25	75	..	..	100	25.0
Denham, Mrs.	..	..	..	88	88	22.0

BENDIGO.

Student's Name.	Colebatch.	Archer.	Paterson.	Hawkins.	Total.	Percentage.
Richardson, H. V. ..	73	98	65	90	326	81.5
McRoberts, W. G. ..	57	72	68	92	289	72.2
Dingfelder, C. L.	48	73	48	65	234	58.5
Clarkson, J.	21	69	54	55	199	49.7

COLAC.

Student's Name.	Lee.	Archer.	Paterson.	Hawkins.	Total.	Percentage.
Moran, J. J.	45	87	53	60	245	61.2
McRae, J. K.	27	73	24	32	154	38.5
Kettle, C.	55	68	..	..	123	30.7
Flett, H.	20	82	..	..	102	25.5
Campbell, S.	20	66	..	..	86	21.5
Wallace, A.	31	55	..	..	86	21.5
Angus, J.	20	65	..	..	85	21.2

CAMPERDOWN.

Student's Name.	Colebatch.	Archer.	Paterson.	Hawkins.	Total.	Percentage.
Kerr, R.	68	99	58	80	305	76.2
Errey, C.	70	93	55	75	293	73.2
Patterson, W. G.	43	94	35	68	240	60.0
Nicholls, W. J.	18	96	45	72	231	57.7
McDonald, Miss Laura ..	..	..	..	100	100	25.0
Scott, Mrs. S. W.	..	..	..	85	85	21.2
Husband, Mrs. H... ..	..	..	..	85	85	21.2
Satchwell, A. J.	..	..	..	70	70	17.5

EUROA.

Student's Name.	Smith.	Archer.	Paterson.	Hawkins.	Total.	Percentage.
Threlfall, R. G. . ..	82	99	60	82	323	80.7
Shovelton, J.	87	99	50	72	308	77.0
McKernan, J. G. .. .	52	83	50	84	269	67.2
Gardiner, A. P.	43	86	43	75	247	61.7
Godden, C.	57	72	42	72	243	60.7
Dudley, A.	52	90	50	50	242	60.5
McKenna, M.	60	88	30	55	233	58.2
Wadeson, E.	35	77	50	60	222	55.5
Belcher, F.	65	67	40	45	217	54.2
Godden, R. R.	25	76	40	75	216	54.0
Ward, J. C.	33	71	40	60	214	53.5
Marke, W.	25	55	39	72	191	47.7
Saxon, T. A. . ..	48	63	..	80	191	47.7
Dunning, W.	23	65	40	60	188	47.0
Wakenshaw, G.	25	60	30	40	155	38.7
McIvor, J. H.	50	88	..	..	138	34.5
Gardiner, A. P.	43	86	..	..	129	32.2
Wilson, P.	30	91	..	..	121	30.2
Maloney, J.	24	45	..	..	69	17.2

KYABRAM.

Student's Name.	*Colebatch.*	*Archer.*	*Paterson.*	*Hawkins.*	*Total.*	Percentage.
De Groot, C.	95	99	90	100	384	96.0
Edis, D. J.	88	94	80	98	360	90.0
Gunn, W. G.	45	97	75	90	307	76.7
Dawes, H. J.	18	98	87	90	293	73.2
Mellis, T. A.	80	89	55	65	289	72.2
McQueen, A. D.	77	88	..	..	165	41.2
Robertson, J.	..	..	85	75	160	40.0
Rogers, E.	..	..	60	..	60	15.0
Gurnan, J.	..	..	50	..	50	12.5

INGLEWOOD.

Student's Name.	Lee.	Haile.	Strong.	Kenyon.	Total.	Percentage.
Wallace, W. W.	94	..	60	75	229	57.2
Vanston, E. J.	35	81	55	35	206	51.5
Lovell, W. F.	82	71	30	..	183	45.7
Bissett, W.	83	98	..	..	181	45.2
Wright, W.	89	84	..	..	173	43.2
Samers, W.	..	81	80	..	161	40.2
Kelly, W. C. J.	55	93	..	..	148	37.0
Tatchell, W. F.	71	53	20	..	144	36.0
Morse, Mrs. R. J. ..	46	83	..	..	129	32.2
Kirk, J. M.	44	81	..	..	125	31.2
Bissott, L.	30	91	..	..	121	30.2
Dewhurst, P.	25	83	..	..	108	27.0
Morse, R. J.	25	83	..	..	108	27.0
Macarthur, H.	..	81	..	..	81	20.2
Gray, R.	..	80	..	..	80	20.0
Griffin, P. F.	67	..	..	..	67	16.7
Palmer, W.	42	..	20	..	62	15.5
Noill, J. A.	..	..	60	..	60	15.0
Paterson, W.	..	..	..	60	60	15.0
Weatheritt, C.	45	..	..	..	45	11.2
Samers, J. J.	45	..	..	..	45	11.2
Avon, C. J.	20	..	..	..	20	5.0

KANIVA.

Student's Name.	Smith.	Ham.	Paterson.	Hawkins.	Total.	Percentage.
McCallum, J. C.	75	88	60	96	319	79.7
Schmidt, F. H.	69	94	68	80	311	77.7
Rowe, E. G. H.	71	88	65	85	309	77.2
Crouch, W. J.	70	83	65	65	283	70.7
Harris, D.	65	83	50	75	273	68.2
Goodwin, A.	63	70	35	75	243	60.7
Schmidt, H.	32	83	50	70	235	58.7
Webb, R. O.	47	83	35	65	230	57.5
Waters, J. E.	27	75	45	55	202	50.5
Baker, F. S.	60	70	45	15	190	47.5
Tink, A. R.	33	86	..	70	189	47.2
Webb, O.	27	85	..	72	184	46.0
Nicholls, H.	27	65	40	40	172	43.0
Goldsworthy, R.	43	80	..	42	165	41.2
Schmidt, A.	62	90	..	..	152	38.0
Webb, A.	60	85	..	..	145	36.2
Goldsworthy, L. J. ..	40	86	..	..	126	31.5
Vivian, A. W.	41	66	..	..	107	26.7
Crouch, Miss Nellie ..	..	..	..	98	98	24.5
Nicholls, Miss Maggie ..	..	..	..	85	85	21.2
McCallum, Miss L. C. ..	..	..	..	70	70	17.5
Tink, Miss Ada	..	..	..	48	48	12.0
Coutts, O.	..	..	..	42	42	10.5

KORUMBURRA.

Student's Name.	Colebatch.	Archer.	Paterson.	Ham.	Total.	Percentage.
Cornall, R.	82	96	60	95	333	83.2
Nicholas, L.	60	96	55	95	306	75.0
Heslop, A.	55	93	49	92	289	72.2
Rainbow, G. H.	43	81	40	83	247	61.7
Cornall, J. C.	50	81	50	59	240	60.0
Bell, G.	90	94	..	..	184	46.0
Rowe, G.	69	79	..	..	148	37.0
Williams, W.	49	91	..	..	140	35.0
Le Roux, R.	55	84	..	..	139	34.7
Rainbow, W. J.	..	..	50	87	137	34.2
Peterson, E. A.	46	79	..	..	125	31.2

KYNETON.

Student's Name.	Lee.	Archer.	Halle.	Paterson.	Total.	Percentage.
Young, Herbert	90	97	88	85	360	90.0
Hamilton, G.	70	91	78	50	289	72.2
Lee, F. W.	50	88	73	60	271	67.7
Sefton, A. W.	..	91	..	70	161	40.2
Jones, D.	60	..	90	..	150	37.5
Tolley, H. T.	65	..	67	..	132	33.0
Halloran, D.	55	..	75	..	130	32.5
Young, J. J.	35	..	78	..	113	28.2
Taylor, J. C.	35	..	63	..	98	24.5
McDonald, A.	..	..	88	..	88	22.0
McDonald, J.	..	..	88	..	88	22.0

The results of the examinations held at the remaining centres are, through want of space, held over until a subsequent issue.—EDITOR.

REPORTS BY THE LECTURERS.

Mr. R. T. Archer.—" On the whole I am very pleased with the replies to examination questions set by me. On the average they are better than in former years. While the attendance at some of the centres has not been as numerous as we could wish, generally we have had the right class of students, and the more intelligent of them fully appreciate the value of the Short Course Classes. I am satisfied the classes are doing a large amount of good, not only amongst that class of settler that constitutes such a large percentage in Victoria, viz., those who have had very little experience on the land and have to learn as they go along, but also amongst the more intelligent and thoughtful of the experienced farmers."

Mr. W. J. Colebatch, B.Sc., M.R.C.V.S.—" The results obtained at these classes are on the whole highly satisfactory though I should like to see a larger percentage of each class competing in the examinations. Of the centres where I have lectured Mildura, Redesdale and St Arnaud deserve special mention for the energy and enthusiasm displayed throughout the course. Some excellent papers were also contributed by members of the Kyabram and Korumburra classes. Mr. McPherson, of Mildura, heads the list with 97 per cent. ; Mr. De Groot (Kyabram) has 95 per cent., and three others have secured 90 per cent. of the total marks.

These figures speak for themselves, and since the average for the whole of the classes concerned is 62.8 it follows that the work has been wonderfully uniform throughout."

Mr. J. Cronin.—"The subjects of the questions submitted were the treatment necessary to check or destroy certain insects and fungi found attacking fruit and fruit trees, and the formulæ of the most important spray washes. With one exception, the answers to the questions denoted close attention and acquaintance with the various phases of the lectures delivered, and if practised would produce fruit free from the diseases that disqualify its sale in our local markets and for export."

Mr. H. Haile.—"The students at the nine centres that I lectured at were quite up to the average, and were the class that are most desirable, viz., farmers who were willing and anxious to learn, and who would apply the knowledge they received. They were men who when they found there was something to be learned at the Agricultural Classes would hunt up a neighbour and bring him along next day.

"The interest taken in the practical class was very great, and the work done by students under my supervision was very creditable. They went away with a good elementary knowledge of wool-classing, and from the way some of their clips have been placed on the market it will be seen that they have not forgotten all they were taught."

Mr. H. W. Ham.—"The papers have been answered better than was expected, especially so where methods and management points were shown on sheep and lambs yarded for the purpose by farmers who took an active interest in furthering the purpose of the classes. Answers bearing on practical work shown, and that which the students did for themselves, are worded closely to detail, and, in every centre, two or three boys show a special liking for sheep work and have answered particularly close."

Mr. H. V. Hawkins.—"The immense value of poultry is hardly realized by those who have paid no attention to the statistics relating to this matter. Nearly every farmer and a large proportion of the other inhabitants of the districts that I have visited during the currency of the classes raise poultry to a greater or less extent. I am of opinion that the instruction given will in the very near future be the means of considerably adding to the income of the students. Many of the examination papers sent in clearly show that keener interest in this branch of farm work has been taken than formerly. Special mention is due to the papers submitted by Miss Leura McDonald, of Camperdown, and Mr. C. De Groot, of Kyabram, each of whom gained the maximum marks."

Mr. F. E. Lee.—"On the whole, the papers reveal evidences of attention to the lectures, but there are too many indifferent replies to satisfy me that the advice given will be intelligently put into practice by more than a limited number of students. I am of opinion that the examinations should either be made more of a feature in the class work, or else abandoned altogether. Voluntary examination has, I think, not proved a success, and it would be perhaps more to the advantage of both lecturer and student if examination were compulsory. In this way the Department would know if the instruction had proved generally useful or not, in any district."

Mr. L. L. Paterson.—"A feature of the class work has been the interest and enthusiasm which students have manifested in the various branches; also the indulgence in and preparation of copious notes taken at the lectures has yielded in the examination papers some very fruitful and creditable results. The stimulus which local bodies have given

students by offering prizes, gold medals, etc., has been in some cases a strong inducement to the closer application to the various subjects. The practical work seems to be keenly appreciated and the demonstrations of shoeing both of sound and unsound horses have been a useful accessory to the veterinary lectures."

Mr. T. A. J. Smith.—"The examination papers submitted by students show that a very fair grip of the subjects dealt with has been obtained. The attendances were distinctly good, and the interest taken augurs well for the future. Practical demonstrations were given in the field on every possible occasion, and I am of the opinion that more field work in connection with the branch I am engaged upon would be of advantage when possible."

A.N.A. GOLD MEDALIST.

The Australian Natives Association has again donated a gold medal for the student gaining the best aggregate of marks in all subjects, and the honour of winning this belongs to Kyabram. Mr. C. De Groot secured 384 marks out of a possible 400, *i.e.*, 96 per cent., a result to be proud of. A glance at the points awarded at each centre will show that there were many very excellent papers, and that the winner had no small task to carry off the prize from 244 competitors, exclusive of a few informal papers. Mr. E. R. Johnson, B.A., the winner of the 1906 gold medal, was placed second with 372 marks, *i.e.*, 93 per cent. Several local prizes were offered by the various associations throughout the State; the successful students in these cases should make application to the association under whose auspices the class was held.

CLASSES FOR 1908.

The Classes to be held during 1908 will be conducted on similar lines to those of 1907 except that no optional subject will be allowed.

THE POULTRY EXPORT TRADE.

A. Hart, Poultry Expert.

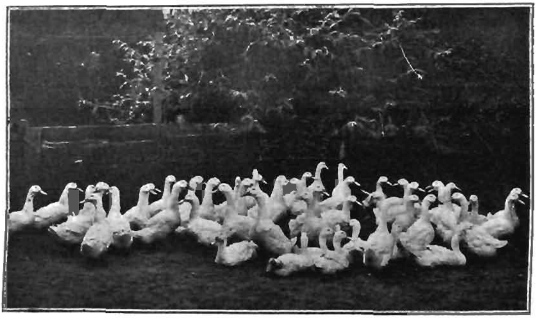
The present indications are distinctly favorable towards the development of a very extensive trade in the export of table poultry to the English markets. The different shipments of chickens and ducklings which have been sent from time to time from Victoria, New South Wales, and South Australia have returned very satisfactory results. These consignments were, in most cases, only of limited numbers, and when small shipments have been so successful there is every assurance that larger consignments must return a greater margin of profit. The poultry sent from Victoria has been very favorably commented upon by the London buyer; for both chickens and ducklings there was keen competition and an extensive demand. There is an unlimited market available for high grade table poultry in England, and producers can have every confidence in securing payable prices for their birds, providing the quality and condition are up to standard.

The breeding of suitable birds for the table is the first point towards procuring an export trade. The different breeds available for the purpose have been fully enumerated on past occasions, and farmers have now to use their own judgment in the selection of stock. This should not be difficult

as pure birds of the required varieties can now be purchased at reasonable figures. The main point in making the selection is to choose birds of good constitution, correct shape, and large size.

Feeding is another point which must receive very strict attention where the export trade is concerned. No matter how good the breed is, poultry keeping for export must be a failure if a regular and correct system of feeding is not practised. From time to time various experiments have been carried out by the officers of the Department. The following one dealing with feeding is of particular interest.

Twelve Silver Wyandotte chickens between three and four months old were selected. At the time they were "rejects," that is, birds too small and low in condition to pass the Government Expert. The weight of the twelve birds was 36 lbs. and the market value would be about 4d. per lb. These birds were placed in a fattening coop and fed as follows:—Pollard, barley meal, maize meal, meat meal, and dripping mixed together with skim milk. The birds were fed on this food for five weeks, the value of the food used amounting to 4s. 8d. (the milk was not reckoned in the cost). During this period these birds gained 18 lbs. of flesh; besides, the quality improved to a great extent. At 6d. per lb. this would mean an increase of 9s. in value, and, after deducting the cost of food (4s. 8d.) would leave a profit of 4s. 4d. on the 12 birds. As previously stated the weight of the birds when put up was 36 lbs. and as it was increased 2d. per lb. in value, this would bring in 6s., making a total profit of 10s. 4d. on the 12 birds. The



AYLESBURY AND PEKIN DUCKLINGS. 10 WEEKS OLD. AVERAGE WEIGHT, 6 LBS.

birds were fed naturally, no crammer or other artificial means being practised. It will be found that the extra weight of flesh cost about 3½d. per lb. to produce, leaving a clear profit at 6d. per lb. of 2½d. per lb.

Experiments made with ducklings went to show that the extra weight in flesh cost about 2½d. per lb. to produce, about 1d. per lb. less than for chickens.

The proper diet for feeding chickens is as follows:—Wheat, heavy Algerian oats, barley and maize. These grains should be finely crushed and mixed together, and scalded with skim milk; kitchen refuse, meat-scraps, or rendered fat can be added. When fat is given it should be supplied three times a

week, at the rate of one pound to twenty birds. The food should be moist and crumbly and in cold weather should be fed warm; grit, charcoal, and green food should be supplied daily. On topping off poultry the sexes should be kept separate, and a warm and dry spot should be selected for penning. The heavy breeds are the most suitable, and the chickens should weigh at least 3 lbs. each when put up for topping off. They should not be more than 4 to 5 months when ready for export.

I am pleased to be able to state that a good all round improvement can be noted in the breed, quality, and condition of the poultry sent in for export. This is fully borne out by the fact that on the London market ducklings brought up to 13d. per lb., while chickens realized from 10d. to 11d. per lb. The demand, even at that price, was much greater than the supply, and numerous inquiries have been made by purchasers as to the arranging of a regular supply. The best months for export to London are from January to March, and for local consumption from September to December.

The following is the value of poultry exported from Victoria from 1st July, 1904, to 30th June, 1907:—

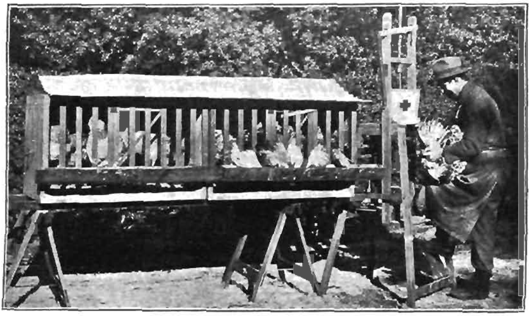
1904-5	£11,677
1905-6	£14,957
1906-7	£17,248

BUFF ORPINGTONS. NOTED FOR THEIR TABLE PROPERTIES.

Experiments have been made both in America and England on the cost of rearing and feeding poultry for export and also egg production, and a comparison of those with the above should be interesting. Professor J. W. Robertson, of the United States, conducted the following test:—Three lots of 12 chickens each of the same variety and age were selected. One lot was placed in a fattening coop and fed twice a day. Another lot was put in an open pen, whilst a third lot was put up in a coop and fed with a mixture of mangolds and ground oats. The food given to the first and second lots was composed of ground oats mixed with skim milk, and during the last few weeks some tallow was added. The birds in the fattening

coop did much better than those in the open, while those fed on mangolds and ground oats were the slowest to improve. The birds fed in the regular way gained about 1¾ lbs. each. About 3,000 chickens were fattened at the Experimental Station, and the average cost for each pound of flesh gained was slightly over 3d. per lb.

An experiment at Reading (England) made by Professor Brown provides some very interesting figures on the cost of rearing. Four lots of chickens were chosen, numbering 30 White Wyandottes, 30 Faverolles, 30 Buff Orpingtons, and 30 cross breds (15 Houdan and Buff Orpington cross, and 15 Indian Game and Buff Orpington cross). The test started from the time the chickens were hatched, and during the whole period the birds were all kept under exactly the same conditions. For the first eight weeks they were fed on cracked wheat, canary seed, millet, dari, cracked maize, hemp seed, buckwheat, rice, meat, grit, &c. The birds were treated naturally all through, and when they were 5 weeks old they were removed from the brooders and placed in houses without perches, remaining there until the end of the test, which lasted 13 weeks.



NATURAL AND ARTIFICIAL METHODS OF FATTENING POULTRY.

An interesting point is the comparison of the weights of the birds of each breed at the end of each successive week, as given in the following table. It will be seen that there was very great variation in the growth in different weeks, although generally speaking, there were similar fluctuations in growth by all the breeds in the same weeks. Thus the fourth week was a period of considerable growth in each case; again the eighth week was marked by a great increase in weight, while comparatively small increases occurred in the first three weeks, and in the fifth, sixth, and seventh weeks. From the table we find that whilst in pure-breds, both Faverolles and Buff Orpingtons started with a smaller weight than the White Wyandottes, after the ninth week they forged ahead, and stood above at the end of the period. Nearly all the time the cross-breds were in the rear, although there were no deaths amongst them. (One bird in each of the other sections died during the test.)

COMPARISONS OF WEIGHTS OF BREEDS.

Ages.	White Wyandottes.	Faverolles.	Buff Orpingtons.	Cross-breds.
	lbs. ozs.	lbs. ozs	lbs. ozs.	lbs. ozs
24 hours old	2 8	2 5	2 6	2 5
8 days old	3 1	3 3	2 11	3 2
15	4 4	5 8	4 14	4 8
22	6 0	8 4	8 4	6 4
29	13 0	14 0	13 0	10 8
36	16 0	16 11	15 5	13 13
43	19 6	20 2	16 12	17 0
50	23 3	23 13	20 2	20 2
57	31 2	31 6	31 11	31 8
64	37 2	36 6	38 13	35 11
71	41 15	43 3	43 15	41 15
78	48 14	49 0	52 2	44 5
85	51 5	54 7	57 4	49 5
92	59 10	61 11	63 2	56 0

GENERAL COMPARISONS.

—	White Wyandottes.	Faverolles.	Buff Orpingtons.	Cross-breds.
Total food consumed ..	237.55 lbs.	233.85 lbs.	226.94 lbs.	216.34 lbs.
Total cost of food	16s. 6d.	16s. 3¼d.	15s. 8½d.	14s. 9¾d.
Weight of food consumed for each pound gained ..	4.16 lbs.	3.9 lbs.	3.72 lbs.	4.03 lbs.
Average cost of food per bird	6.8d.	6.75d.	6.5d.	5.92d.
Cost of increased weight per pound	3.45d.	3.3d.	3.1d.	3.3d.
Average gain in weight ..	1 lb. 15¼ ozs.	2 lbs. 0¾ ozs	2 lbs. 0¼ ozs.	1 lb. 12⅔ ozs.
Average weight, 13 weeks ..	2 lbs. 1 oz.	2 lbs. 2 ozs.	2 lbs 3 ozs.	1 lb. 14 ozs.
,, ,, cockerels ..	2 lbs. 1½ ozs.	2 lbs. 2 ozs.	2 lbs. 3 ozs.	1 lb. 13½ ozs.
,, ,, pullets ..	2 lbs.	2 lbs. 2 ozs.	1 lb. 13 ozs.	1 lb. 12½ ozs.
Greatest gain	2 lbs. 5½ ozs.	2 lbs. 8¾ ozs.	2 lbs. 5¾ ozs.	2 lbs. 3¼ ozs.
Least gain	1 lb. 11½ ozs.	1 lb. 8¾ ozs.	1 lb. 6¾ ozs.	1 lb. 1 ozs

As most of the chickens raised were required for breeding stock or for later fattening, they were not killed at the end of the test, and thus the gross profit cannot be stated. The experiment, however, shows the actual cost of hatching and rearing to thirteen weeks of 117 birds as follows.—

		£	s.	d.
29	White Wyandottes at 8.66d. ...	1	0	11
29	Faverolles at 8.61d.	1	0	9¾
29	Buff Orpingtons at 8.36d. ...	1	0	2½
30	Cross-breds at 7.71d. ...	0	19	3¼
117	Total cost	4	1	2½

The total weight of chickens produced at thirteen weeks was 241 lbs. 2 ozs.

FARMERS' WOOL CLIPS.

H. W. Ham, Sheep Expert.

The disposal to advantage of small and medium sized farmers' clips has given for years a deal of trouble and extra work to our woolselling firms, who show at all times a genuine desire to obtain the highest possible returns for such clips. Such a number of conditions and influences operate that it is impossible to say that what is done by one farmer and the price obtained by him for his various sorts must hold good for another farmer, even if the breed of sheep is identical and the farms adjoin.

The desire with a large clip is to avoid star lots, that is, lots of less than four bales. In a small grower's clip, this is impracticable but sorts should be kept distinct and even lines made of as many bales as possible. The aim should be to give confidence. If every sort is separate, one knows exactly how much there is of each, and if each sort can be seen, and is proportionate to the size of the clip, then it is taken for granted that all sorts are even and not mixed; so little of a clip can be seen without undue cutting of bales, that a buyer must judge by this means. If he has an order for say medium grade crossbred, and he sees the fine fleeces in one lot, and the coarser ones in another, and the pieces, bellies, &c., in other separate lots, then he naturally concludes that the medium grade he has orders for, is even and like the sample shown. The general impression with small farmers is that "wool is wool," and that a wool buyer takes all and every sort that the broker in an unwary moment, puts too low a value on. What would interest and cause many small farmers to do this work better, is to know that various grades and sorts have different uses, and that whilst many mills have machinery to work some wools, they are not buyers for other sorts.

Sheep owners should never forget that wool can be kept separate at a fractional cost in the shed at shearing time, and that it costs ten times as much, and is sometimes impossible of separation, when once mixed and pressed up. It cannot lessen the value of a small grower's clip to have all sorts well separated. If the broker finds it advisable to sell the sorts separately he can do so, but if he decides to interlot them, it is then possible for him to adopt that course. In the case of merinoes, when wool is plentiful and buyers are paying most attention to lines, it is often advisable, in order to obtain best net results, to catalogue two classes together, for when clean scoured they are both suitable for the one purpose, yet in the grease, owing to difference of yield in clean wool, it is necessary to know exactly how much of each there is.

In cleaning up after shearing, lamb-raisers, with 100 to 200 sheep, find that they have a little of each sort, which they put into bags. This practice is wrong. It is usually done to save a pack, but at the usual price of bags, assuming a farmer uses four or five, it comes to nearly the price of a pack, which is about three shillings. Bag lots are sold at bag sales, and lose the competition of the better class of buyers. On the other hand if each lot is put in the pack in order of merit, and divided with a piece of hessian, one thickness between each sort, it is offered at the main sales. A line should be drawn on the outside of the bale, opposite where the division is, by placing two stencil plates about half an inch apart. Supposing the wool is bought by a local woolscourer, it

is more valuable to him this way, than if mixed, for when he opens the bale, each lot being separated by the hessian, the wool can be placed and matched with other sorts bought similarly, and does not cost anything for resorting. As stated before, keeping sorts separate can be done much more cheaply at the outset than afterwards, when mixed and pressed or bagged up. However little of a different sort there may be, keep it together, but never forget to mark on the outside of the bale exactly where it is.

In skirting there is no hard and fast rule as to how much to take off, neither in individual fleeces or in flocks. Burrs, thistles, coarse breeches, neck folds, all have to be reckoned with; and unevenness of covering in many flocks also causes thin and locky skirts. All these things have an influence on each fleece, but no more should be taken off than is really necessary. An extra hand or two at the wool table often saves tearing off good fleece wool with the fribbly pieces, especially on the arms and necks. Many owners make unnecessary work for piece pickers by not having enough hands at wool tables, and besides sustain a loss, not perhaps per pound, but in total returns.

Too much notice of how a neighbour does his wool is often misleading. Given the same breeding of sheep and wool, and similar country, a little over stocking at this time of year may cause a break in the staple and shortage of growth. A neighbour may give more room, and have a superior clip. Again, in the case of adjoining paddocks, one may be timbered and another open; the soil of one has a hard surface, and in another there is a class of land that cuts up in summer, and therefore more dusty; some paddocks are not so bad for grass seed and burr as others; whilst stubble land will cause a dusty tip. These and many other matters have more influence on price per pound than even the proper division of sorts; the latter gives a better total result. Farmers should aim at best return per head and per acre, and have less sentiment as to price per pound.

With regard to price per pound and total return, our brokers could give greater satisfaction if farmers would assist by keeping their various sorts separate and being always mindful of the many details connected with wool growing.

MATING RAMS AND EWES.

H. W. Ham, Sheep Expert.

In most districts the month of January is about the time lamb-raisers join the rams with ewes. In some of the later districts it is too early, as the lambs come in June and July when the grass is not milkgiving, and the ground is wet and cold for the young lambs to lie about and rest. The result is they do not thrive, and become poddy, and the time the ewe lasts in duration of milk is wasted—the important point of making the lamb the desired weight and quality during the four months the ewe's milk is at its best, is lost. In the case of fodder crops, it is in the months of September, October, and November that these are at their best. Lambs should therefore be timed to come about July and August, as the ewes are then in the best stage to give most milk and the lambs are beginning to eat by the time the crops are ready.

No one denies that to get best results, both ewes and rams should be of correct shape, but as a matter of fact, it is rare to see a farmer with five or seven rams all equal or nearly so. He can always point to some he likes as being thicker and better shaped than others. It is as well where possible to give the best rams the first twenty-one days, making sure that the ewes are in season for this period—some of the coarser cross-breds and pure English ewes do not come in season until February. Some lamb-raisers who depend on natural pasture only like the lambs to drop all about the one time, while with smaller men, with fodder crops and near markets, the tendency is for a more prolonged lambing.

In some cases where fences are not the best, rams cannot well be kept separate and in that case an apron, cut out of any stout tough material, about ten inches deep, and sixteen inches wide, should be tied round the inferior rams so as to hang just in front of the pizzle. This allows them to tease but not to serve, and is one way, when others fail, of allowing the better rams to do the greater amount of work. It is a recognised fact that light made weedy rams will tup more ewes in a given time at the outset of a season, than the thick set, heavier, and less active ones. After three weeks, or six weeks, at the discretion of the breeder, the apron can be removed and the second class rams allowed to finish up ewes not yet in lamb.

Hoofs should be seen to and trimmed before being joined. Rams canno. get about and serve so well while allowed to grow long and ugly hoofs as is often the case. Aged rams should be examined to see if any long and loose teeth want removing, as they cannot get hold of the feed at this period of the year if the teeth allow it to slip through. They will do better without such teeth. At this time of year a white scum will often spread over the eyes of a flock. If a ram has a moist streak down the face from the eye, he should be examined. The ailment is commonly credited to grass seed, but it is, in nine cases out of ten, ophthalmia. On the face, in front of the eye, there is a small vein close to the seat of the trouble which should be touched lightly with a pen knife; it will bleed freely but without danger. This action will hasten recovery, and save loss of flesh and time.

Rams of the British breeds give cause for complaint at this time by not going with the ewes. As a rule they will not go about with them in the day time, but work in the night. When a flock of ewes is properly in season they stick to the rams more than the rams to them.

Rams or ewes excessively fat are a trouble, so are two tooth rams, but later on as the heat increases, the fattest will lose condition and will go together. Late in the evening and early in the morning are best times to judge if ewes are in season. One year old rams should have one or two older rams amongst them.

Roughly speaking, seventy ewes are all a ram should be given. With one year old and aged rams, thirty to forty are about the usual number, according to the season. Two, three, and four year old rams, when in good condition, &c., and a deep purple colour can be found around the testicles, can be expected to serve eighty to ninety, but above these numbers there will be a risk of occasional weak lambs.

In country where ewes scour and get daggy, they should be occasionally cleaned,, as at times they cannot be served through it. It is very seldom a ewe is barren through any other cause than excessive internal fatness. Stud ewes at times get very fat and they should therefore be kept on scanty feed for a few weeks before joining.

DISEASES OF FARM ANIMALS.

(*Continued from page 708, Vol. V.*)

S. S. Cameron, M.R.C.V.S., Chief Veterinary Officer.

VII.—ACCIDENTS AND INJURIES.

Fractures.—Definition—Causation—Kinds—Repair or "Knitting"—Diagnosis—Treatment—Frequent fractures, base of skull, broken neck, broken back, broken ribs, split pastern, broken pelvis, dropped hip, patella or stifle-cap, broken leg.
Dislocations and Luxations.
Sprains.
Wounds.—Gravity—Variety, incised, punctured, lacerated—Healing—Treatment, lotions, powders—Special Wounds, open joint, open bursæ and tendon sheaths, broken knees.
Abrasions, Bruises, Contusions, and Abscesses.—Sore shoulders, saddle and girth galls—Sitfasts—Fistulous withers—Capped elbow—Capped knee—Capped hock—Capped shins.
Burns and Scalds.
Ruptures (Herniæ).—Navel Rupture (Umbilical Hernia)—Scrotal or Inguinal Hernia.

FRACTURES.

A **Fracture,** in surgery, is defined as being "a solution of continuity of bone or other hard tissue." It means literally the act or result of breaking, or the state of being broken, of a solid substance as distinguished from a *rupture*, the latter term being applied to the breaking or tearing asunder of soft structures. Except when applied to the breaking

Fig. 1. Occipital (*a*) and Sphenoid (*b*) bones at base of brain fractured in two places. (After Williams.)

of the cartilages of the ribs or other cartilaginous structure the term fracture is always associated with the breaking of bones. Fractures usually result from violence, the incidence of which may be direct or indirect.

Direct violence is the most common cause and it may be sustained from *without*, as when a kick or blow is inflicted, or from *within*, as when the pastern bone is broken as a result of sudden jar or shock received from the column of bones above.

Fracture by INDIRECT VIOLENCE occurs when the fracturing force is applied at a part remote from the seat of fracture—when the violence sustained is transmitted by concussion and produces its effect by counter shock at some distance from the seat of direct injury. The most frequently met with example of this is fracture of the basi-occiput or basi-sphenoid at the base of the brain from violence applied to the poll (crest of the occiput) (see Fig. 1), such as may occur when a horse rears and throws himself backwards on the back of his head or when he "somersaults" over a fence and strikes the ground with the poll.

As an instance of fracture resulting from the inordinate application of muscular power the breaking of the bones of the back (vertebræ) occurring during the struggling of horses when cast for operations, may be cited.

KINDS OF FRACTURE.—Fractures vary in character and degree of gravity, and for descriptive purposes they are classified as follows:—

1. SIMPLE FRACTURE in which the break is single and the soft structures surrounding are uninjured. Such fractures may occur either *with* or *without displacement* of the broken surfaces. In the latter case the broken ends of bone are usually maintained in position by the periosteum—the strong fibrous covering of bone—and in such cases the repair of the fracture, or knitting of the broken bones, takes place quickly. Fracture without displacement also occurs when a bone (the *tibia* for instance) is split lengthways and only partially across, thus:—

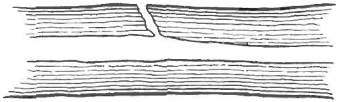


Fig. 2. Sketch of partial fracture of a long bone (the tibia) without displacement of the fractured ends—otherwise called a "green-stick" fracture.

Such a fracture is often called a "green-stick" fracture on account of its resemblance to the partial breaking of sappy wood.

2. COMMINUTED FRACTURE in which the the bone is broken into several pieces. (See Fig. 3.)

Fig. 3. Comminuted fracture of the arm bone of the horse (the *humerus*). Frequently the fragments into which the bone is broken in a comminuted fracture are much more numerous. (After Dollar.)

3. COMPOUND FRACTURE when, accompanying the fracture, there is an external wound communicating with it.

4. COMPOUND-COMMINUTED FRACTURE when there is an external wound communicating with a fragmentary fracture.

The two latter forms are the most grave on account of the great liability to infection of the wounds with septic matter, and the spread of the consequent suppuration to the seat of the fracture.

Any of the bones of all domestic animals are liable to be fractured,* but it is the point of the hip and the bones of the limbs, especially the pastern bones, which are most frequently broken; more rarely those of the face, skull and back. From the nature of their activities, fractures are sustained by the horse and the dog more frequently than by cattle and sheep. In all animals however the rule is general that fractures are of more common occurrence in the old than in the immature or young; this because of the increasing fragility or brittleness accompanying the hardening of bone as age increases.

Repair or "Knitting" of Fractures.

A full exposition of the process of repair of broken bones would be redundant in a work of this character, and for such as require it reference to a special treatise on pathology is recommended. It will suffice here to confine attention to the salient steps in the process of union. A preliminary remark ought to be made however with a view of dispelling a very prevalent idea amongst horsemen, that in horses fractured bones never, or only tardily, unite. In point of fact, provided the fractured bones can be kept in a state of quietude, fractures "knit" more rapidly in horses than in man or other animals. This is on account of their possessing that peculiar bone forming tendency described in a previous chapter (page 266) as an "ossific diathesis," and which is also exemplified in the readiness with which splints, ringbones, spavins and other bony outgrowths are developed. That many horses, as also other animals, do not recover from severe fractures is due solely to the great difficulty in keeping the seat of fracture in a state of rest in animals that cannot be restrained from movement by other than mechanical means. The human surgeon adjures his patient, under pain of permanent deformity, to remain quiet and avoid movement of the fractured part. No such method of control can be practised with animals and except some effective device for fixing and maintaining the bones in apposition can be adopted their union is often prevented.

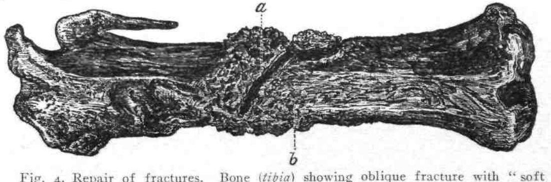


Fig. 4. Repair of fractures. Bone (*tibia*) showing oblique fracture with "soft callus" between fractured ends, (*a*), and "provisional callus" surrounding. (After Williams.)

On the occurrence of a fracture, a condition of inflammation, with exudation, of the parts surrounding is set up. At the end of about three days and from then until the twelfth day the inflamed blood vessels in the vicinity exude a soft lymph which encases the broken ends of bone and

* The author has had the unusual experience of encountering a fracture of the hardest bone in the body—the *petrosal* or bone of the ear.

is called a "soft callus." In the case of long bones with a medullary canal this soft callus ensheaths the fracture on the outside and also exists as a plug on the inside. A quantity of the jelly-like lymph is also exuded between the broken surfaces and serves to prevent their rubbing together. From the twelfth until the thirtieth day the soft callus is undergoing conversion into bone, so forming what is called a "provisional callus." In long bones the provisional callus exists as a ring or ferrule of bone embracing the broken ends externally and as a bony plug filling the medullary canal; and by means of it the broken surfaces are kept fixed in position. During this stage the soft callus between the broken surfaces is converted into dense fibro-cartilage which during the next month becomes transformed into bone. When this is accomplished it is called a "permanent callus." The union of the fractured surfaces being now completed there is no need for the continuance of the provisional bony callus ensheathing the bone and plugging the medullary canal. It is consequently gradually absorbed, but the process is a slow one, taking four or five months to accomplish, and during this time the permanent callus becomes hardened and strengthened to a normal degree. The ensheathing bony callus is seldom completely removed, a roughened surface usually remaining by which on careful manipulation the previous existence of a fracture can be determined. (See Figs. 4 and 5.)

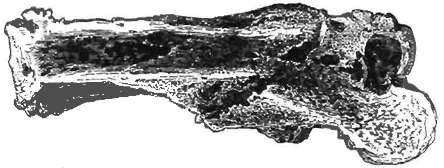


Fig. 5 Repair of fractures. Section of fractured bone (femur) showing "provisional callus" surrounding fractured ends and also filling the medullary or marrow canal. (After Williams.)

When movement is allowed to occur the "knitting" process occupies a much longer period and oftentimes the permanent callus or bony union is never formed. Instead, the material between the broken surfaces develops into fibrous tissue by which the broken bones are held together, so forming what is called a *false joint.*

Diagnosis of Fractures.

In situations where the fractured bone is thickly covered with flesh the symptoms of fracture are obscure and the diagnosis difficult. In most cases, however, there is sudden and extreme lameness the seat of which is easily ascertained by an evident deformity of the part and by its abnormal mobility. When limb bones are broken the parts below hang loose and pendulous, no weight can be borne on the limb, there is usually great pain evinced on movement or manipulation of the part and a grating or crepitation may be felt or perhaps heard when the broken surfaces rub together during movement. An exception to the foregoing occurs in some fractures of the tibia (bone of the gaskin) when the strong periosteum holds the fractured bones in position and prevents displacement. A considerable swelling quickly appears if the tissues round about are loose, and general fever or distress may be exhibited.

Treatment of Fractures.

As previously indicated absence of movement is the prime necessity in the quick repair of a fracture. The broken ends of the bone should be brought together into as natural a position as possible and some means adopted to keep them there. Of such means the use of splints and bandages is the most satisfactory. Perhaps the best material for splints is stout sole leather cut to the required shapes and sufficiently long to extend beyond the joints above and below the fracture. It should be softened by soaking in warm water before use, so that it can be moulded to the part to which it is applied, when, on drying and hardening, it will retain its shape. Underneath the splint and next to the skin some soft material such as cotton wool should be applied so as to fill all depressions and inequalities and so avoid uneven distribution of pressure by the splint and bandage. If this is not carefully done chafing and bed sores will result. The splints are to be fixed in position by means of calico bandages, evenly and firmly applied so as to give uniform pressure and adequate support. Whether splints are used or not (and in some cases they are not necessary) the bandage should extend beyond the neighbouring joints so as to limit their movement. The stiffening of the bandage is of great advantage in limiting movement and it is usually done by soaking it before applying in some substance that will set stiff, such as thick-boiled starch or flour paste, moistened plaster of paris or melted pitch. There is considerable scope for ingenuity in devising and affixing and applying mechanical contrivances of iron or wood to prevent movement of the factured limb according as one part or another is the seat of fracture. (See Fig. 6.)

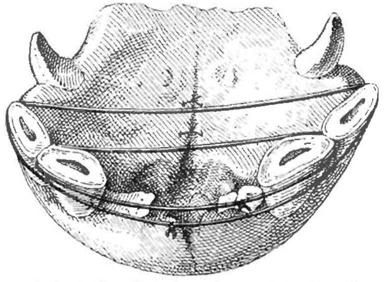


Fig. 6. One method of "fixing" the bones in case of fracture of the lower jaw in the middle line. (After Dollar.)

When a fracture occurs in a position that cannot well be bandaged—as for instance the shoulder blade or arm bone in the fore limb or the pelvic bones or femur (thigh bone) in the hind limb, it is often a good plan to immediately apply a fly blister. The resulting swelling gives the necessary support to the parts and mechanically interferes with movement, and the pain attendant on it also retards voluntary motion.

With irritable animals, especially dogs, it is always advisable to smear the outer surface of the bandage with a solution of aloes or other bitter substance so as to deter the animal from biting it off.

The only word that the author is inclined to say as to the use of slings in fractures is that in his experience it has not been an advantage or success. Slinging tends to increase that which it is of prime importance to avoid, viz.:—Irritability and fidgeting, and the almost certain formation of bed sores becomes more than a mere annoyance.

In limb fractures in horses it is a necessary precaution to remove the shoe of the opposite foot and to pare the wall so as to give frog pressure; otherwise an attack of laminitis in that foot may be expected on account of it having to bear the whole of the weight. Some matting or other soft material ought also to be provided for the weight-bearing foot to stand upon.

Frequent Fractures.

FRACTURE OF THE BASE OF THE SKULL.—This is usually an example of fracture by indirect violence described at page 58 (*q.v.*). It is generally suddenly fatal.

BROKEN NECK usually occurs as a result of a fall or "somersault" when jumping. If the fracture occurs in the upper part of the neck it is almost instantly fatal, death resulting from respiratory paralysis on account of the pressure of the broken bone on the spinal cord above the origin of the phrenic nerve which controls the respiratory muscles. (See Fig. 7.)

Fig. 7. Broken neck with displacement in the region of the third cervical vertebra. (After Dollar.)

BROKEN BACK.—By this is meant fracture of one of the spinal bones (vertebræ) in the region of the back or loin. The fracture may occur either with or without displacement. In the latter case, occurring after an accident no suspicion may be aroused for a time, until, in fact, displacement occurs through sudden movement or wrench as when getting up or lying down. Broken back occurs under similar circumstances as broken neck, but another fertile source especially in horses with fragile bones is the practice of tightly roping animals when cast for operations. The muscular force exerted by horses when struggling under such circumstances is very great, and it often happens to be sufficient to break the back; for, when the limbs are tied by a rope round the back the bones of the back will give way before the rope.

The *diagnosis* of broken back is not always easy. There is usually paralysis behind and also insensibility to pain produced with a pin or penknife. Usually also the animal is incapable of moving the tail. Except

the history of the case points to broken back an opinion should never be formed without first examining the urine. In broken back it should be normal but in other cases in which there is hind paralysis, e.g., azoturea—it will be coffee-coloured or otherwise abnormal.

BROKEN RIBS.—This is a common accident the fracture being sustained from a collision, fall or blow. Some times a dozen ribs or more may be fractured without permanent damage, other than unsightliness, being inflicted. Recovery usually takes place quickly. Sometimes the injury is accompanied by hœmorrhage from the lungs through the broken end of a rib penetrating into the lungs. Penetration of the skin is less frequent.

Fig. 8. Fracture of first rib. Common method of union. (After Dollar.)

When the first rib is fractured (see Fig. 8) as the result of a sudden forward plunge or jerk against the collar great lameness is evidenced. It is often mistaken for shoulder lameness from fracture, but can be distinguished from it by the fact that crepitation can be recognised only when the limb is pulled in an outward direction or pushed inwards across its fellow and not when pulled backward or forward.

Fig. 9. Fracture of the point of the elbow (right side) the fracture penetrating to the elbow joint. (After Dollar.)

BROKEN ELBOW.—The point of the elbow (olecranon) is occasionally broken in horses; and although repair may take place permanent lameness frequently remains on account of the surface of the joint being involved (see Fig. 9).

(*To be continued.*)

THE ORCHARD.

James Lang, Harcourt.

The splendid rains which have just fallen will be of incalculable benefit to the fruit crops which in very many cases were suffering from the prevailing dry weather. The rain came in time to be of the greatest benefit to the fruit crops. It is not very often that such copious rains fall at this season of the year throughout the State, and it is possible after this break in the weather that we may get frequent showers throughout the summer and so keep the fruit growing and allow it to swell off to a satisfactory size. It will be necessary to again scarify the orchard, if possible, while the ground is moist. This will prevent the surface from caking and conserve the moisture longer than would otherwise be the case.

Spraying for codlin moth will still require attention, at fortnightly intervals. The second brood is now hatching out, and careful spraying is necessary to keep the moth in check as far as possible. Where woolly aphis is showing the trees should be gone over again and dressed with the potash sulphur remedy.

Gathering and marketing the fruit will now take up a great deal of the time of the orchardist. Although crops are much lighter than usual, the increased prices obtained will help to make up for the deficiency in quantity. Those growers who intend shipping to the London and German markets should make early arrangements for cool space. The London market is likely to be very good this season, as the supplies from America have been very much below the average of previous seasons. Owing to the American shortage, the market will be practically bare of apples when the consignments from the Commonwealth reach London and good prices are sure to be realized for all shipments arriving in good condition. When packing their first consignments shippers should be careful to see that the fruit is clean, especially from the bitter pit. The disease named always develops more in the first two consignments than in the later shipments, and is a cause of great complaint from the London buyers. Extreme care should therefore be exercised in seeing that the fruit is free from this disease. Vegetable Pathologists throughout the world have been devoting a great deal of time to experiments in trying to find out the cause of this disease, but so far without any definite results.

In looking over the account sales of fruit received from London last season one is struck with the good prices realized by some of the early ripening varieties of apples. Such kinds as Gravenstein, Kentish Fillbasket, Lord Nelson, Purity, Reinette de Canada, and Emperor Alexander, arrived in good condition and brought from ten shillings to twelve shillings per case. This shows the care now taken by the Shipping Companies in regulating the temperature of the cool chamber as a few years ago it was impossible to land these early varieties of apples in anything like good condition. The best prices, however, were realized for Jonathan, Cleopatra, Munroe's Favourite, Esopus Spitzenberg, Newtown Pippin, and London Pippin, and the grower who can ship these varieties in quantities will always realize the best average price.

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PACKING FRUIT FOR EXPORT.

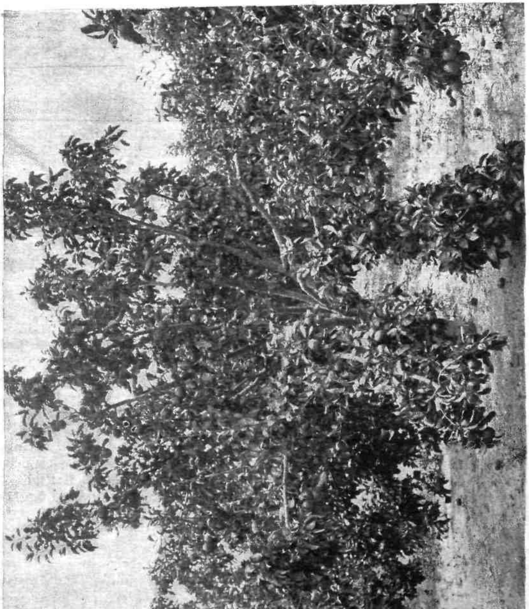
J. G. Turner, Senior Inspector of Fruit Exports and Imports.

Since the publication, in former numbers of this *Journal*, of articles on the packing of fruit for export, new conditions have arisen. These conditions owe their existence to the inception of the new regulations which have been brought into operation within the last year or so, viz. :—The Commerce Act and the Fruit Cases Act. It is therefore thought necessary to bring before those growers, who may be unaware of the new laws, the principal points to be observed in putting up their produce so as to conform with all requirements.

In the endeavour to establish and maintain a profitable oversea market for the rapidly-increasing output of our Victorian orchards too much attention cannot be given to the important item of putting up fruit in an attractive and honest manner. In advices received from the United Kingdom, South Africa, and other oversea markets, the one key-note is invariably sounded :—"Pack nothing but the choicest fruit, grade evenly, pack full cases and pack them honestly throughout; inferior, badly-graded, diseased and dishonestly packed fruit we do not want at any price, as it gives us more trouble than it is worth, injures the good reputation of other shipments and results in loss to every one concerned." Growers cannot give too much attention to this important matter. It is obvious that it costs just as much to pick, pack and export inferior fruit as it does to handle only the best. Against this labour the grower often realizes dead loss or barely sufficient profit to pay his expenses, to say nothing of the bad reputation gained—a reputation unfortunately shared by other growers who have taken trouble to put up only the best. It may be said that nowadays with our Vegetation Diseases Act, Fruit Cases Act and Commerce Act, it is impossible for any but the choicest of fruits to be shipped for export; but, unfortunately, such is not exactly correct. The grower may put up fruit of an uneven size, or his fruit may be too green or withered or over-ripe, or packed in newspaper or other inferior wrappers. Under certain circumstances none of these faults can be dealt with under existing enactments, but there is no doubt that fruit put up under such conditions will

soon find its proper level. Were it not for the damaging effect of these inferior consignments upon high-grade shipments we could afford to ignore them. Happily, shipments of this sort are becoming rarer every year as our knowledge of export requirements advances.

The necessity for our growers paying attention to even the smallest points, so that they may not be left behind in the race, is becoming more apparent every year. Although we have, so far, enjoyed almost a monopoly of the Continental markets as far as antipodean fruits are concerned, the



A GOOD CROP OF A FAVORITE EXPORT APPLE—CLEOPATRA.

entry of such new competitors as Cape Colony and the Argentine Republic should awaken in our growers the determination to hold first place for all time. The immense possibilities of the market before us are practically undreamt of. Taking the United Kingdom alone, we find that out of the immense quantity received there from all parts of the world, Victoria contributes only one case out of every thousand. The demand of the

United Kingdom for foreign-grown fruit is ever on the increase. That this is so is shown by the following figures:—

Years.					Values.
1845	..	...	..	...	£886,888
1865	...	...	..	...	£3,185,984
1885	...	...	..	...	£7,587,523
1905	...	...	...	...	£9,983,119

When it is remembered that the above figures do not include the importations into foreign countries some idea may be gathered of what may yet be done by the growers of this State towards sharing in this enormous trade. That our opportunity is all the more inviting is shown by the fact that nearly the whole of the supplies of the foreign-grown fruit is drawn from the Northern Hemisphere; also that at the time of the year when we are forwarding our shipments the markets are comparatively bare. To grasp and to hold that opportunity certain conditions must be observed:—Economy in production, honest packing of high-grade fruit, cheap regular and invariable oversea carriage and businesslike supervision and control of output at each centre of distribution. And not the least of these conditions is:—Honest packing of high-grade fruits.

Varieties.

In selecting varieties for export it will be better for the intending shipper to confine himself to not more than five or six varieties at most. It is preferable to work up a reputation on two or three standard varieties which are in constant demand than to spend much time, effort and cash in pushing varieties about which little or nothing is known by the trade or the consumer.

The three varieties mostly sent from this State, and from which the best all-round results have been gained, are:—Jonathan, Cleopatra (or New York Pippin) and Munroe's Favourite (or Dunn's Seedling). The three other varieties that may be recommended, judging from the results of the last ten years, could be selected from London Pippin (or Five Crown), Statesman (or Chandler), Rome Beauty, Newtown Pippin, Esopus Spitzenberg and Ribston Pippin. There are, of course, other good varieties suitable for export, such as Rymer, Baldwin, Ben Davis, Bismarck, King of Pippins, Prince of Pippins, Scarlet Nonpareil, Annie Elizabeth, King of Tomkin's County, Stone Pippin, Adam's Pearmain, Dumelow's Seedling, Winter Strawberry, Kentucky Red Streak, Crow's Egg (or Late Wine), Reinette de Canada, Cox's Orange Pippin, Nickajack and Sturmer Pippin. The later varieties just enumerated have all stood the test of some years' experience. They are all good carriers, but, judging by past results, profitable returns cannot be so uniformly relied upon as in the case of the first half-dozen sorts. Another point to be considered by the intending shipper is the suitability of these varieties for each market. Judging from returns received, Continental consumers do not take kindly to the sweeter varieties. The failure of the Rome Beauty to secure higher prices last season has been put down to this; but Jonathan, Cleopatra, London Pippin and Munroe's Favourite scored very well. Some apples although suitable for export, should preferably be sent to ports not too far distant; Adam's Pearmain is one of these and for that reason has been mostly shipped to such countries as Cape Colony, India, &c.

With regard to pears, the varieties mostly sent are Vicar of Winkfield, L'Inconnue, Winter Nelis, Josephine de Malines, Broom Park, Eyewood and Uvedale's St. Germain. Other varieties have been sent and have

AN UP-COUNTRY FRUIT-PACKING SHED. PACKING APPLES FOR EXPORT.

carried well, such as Beurré Clairgeau, Bon Cure, Beurré d'Anjou, Autumn Bergamot, Winter Cole, Glou Morceau, Keiffer's Hybrid and Magnifique. Such sorts as Beurré de Capiaumont, Beurré Bosc and William's Bon Chrêtien have been sent and have realized high prices, but there is a great risk in sending such soft fruits as those three last-named as they almost invariably land in a rotten condition.

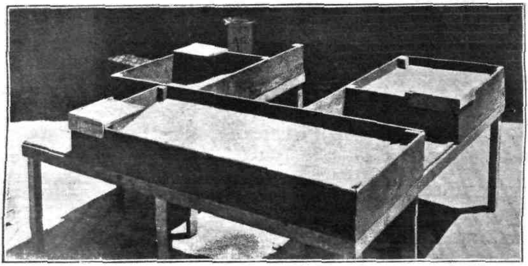
PICKING, COOLING, GRADING, AND PACKING.

PICKING.—The exact time for picking pip-fruits, such as apples and pears, can only be determined by actual experience. In a general way, it may be stated that such fruits are fit for export when the pips have changed from their original light tint to a brown colour, but this, in itself, is not always sufficient. The fruit should be fully developed, but not fully ripe. Some amount of colour should be developed in the red variety of apples—such as the Jonathan, for instance. Undersized fruits should be left on the tree for home requirements or may be left to develop for later shipments. Fruit should not be picked unless dry. Gather the fruit in the early part of the day before it becomes warmed by the heat of the sun. Avoid all bruising, as bruised fruit is useless for export. To get about rapidly among the branches, without smashing your way into them it is preferable to use a ladder similar to that used in some American orchards—a light pointed affair something like an elongated letter A. Do not shake or drag the fruit from the trees. Cut or break each fruit off at the spur. By pulling, the fruit is often damaged, the stalk torn out and an opening made for the germs of decay to enter. See that from first to last the fruit is handled with the greatest care. Fresh fruit bruises readily, and bruised fruit is spoilt fruit, and consequently will not carry for export.

COOLING.—Before packing, the fruit should be cooled off and "sweated." Judging from the appearance of some of the fruit examined by the Inspectors at the port of shipment, the importance of cooling fruit and keeping it cool is not appreciated as it should be. Fruit will not have much chance of getting aboard if it is picked warm, wrapped warm, and rushed off to the seaside, where a cool breeze will lower its temperature and start the condensation of moisture. Keep it a few days in the shade of your fruit-shed or storeroom. This will give it a chance to get down to the proper temperature, will dry any moisture, toughen the skin, and add to its chances of successful carriage.

GRADING.—For the grading and packing of fruit any bench or table may be used, but when large quantities are dealt with, and time is the essential consideration, a specially-constructed sloping table is best, so that the fruit will travel towards the operator as he packs. There have been many contrivances invented for grading of fruit; but, while these have been satisfactory enough as far as grading is concerned, complaints have been numerous concerning the damage caused by the oscillation or other motions of the machines. In many parts of the United States and Canada (the two largest fruit-growing and exporting countries) grading by machinery has been abandoned in favour of hand-grading. It is impossible for a packer to do rapid and good work unless his fruit runs before him evenly in point of size. The main points in grading are:—Size, colour and freedom from disease. Uniformity of size and quality, right through every case, should be aimed at—no "topping up" and no filling in the corners with small fruit. The packer himself is the only person deceived by such practices.

Grades of apples are mostly dependent on the demand and the variety of fruit. The English market prefers a good, clean, medium-sized fruit. Abnormally large fruit is not desirable, especially as, in some varieties,



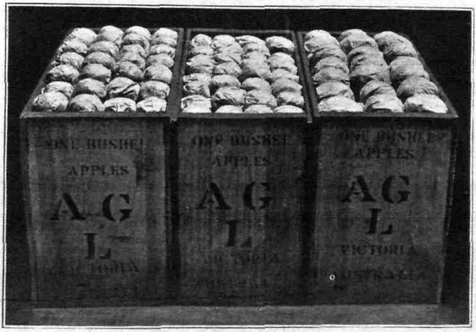
THE PACKING TABLE.

the larger fruits are most likely to develop the disease known as Bitter Pit. Some successful shippers pack two sizes of fruit, others three. Such larger apples as Esopus Spitzenberg, Rome Beauty, and Munroe's Favourite may be put up in three sizes, viz. :—3 inches, $2\frac{3}{4}$ inches, and $2\frac{1}{2}$ inches. The smaller apples such as Jonathan, Pomme de Niege, and King of Pippins may go as low as $2\frac{1}{4}$ inches. As for pears, none should be sent under $2\frac{1}{2}$ inches, except such smaller varieties as L'Inconnue or Winter Nelis.

PACKERS AT WORK.

Diseased or unsound fruit may not be exported, as it is contrary to the law. Therefore, throw out fruit showing traces of disease, damage, decay, or deformity.

PACKING.—Wrap each fruit in tissue-paper cut to cover each apple or pear thoroughly. A ream of this paper cut to 10 x 10 inches will do about 22 cases. Tilt one end of the case slightly up while packing. Each case should be lined with clean white paper, not printed newspaper; place a little padding (paper shavings or "wood-wool") at bottom, and proceed to pack by laying the fruit in rows lengthways firmly, but not so tightly as to bruise. Some experts pack without using any padding. This means, of course, more fruit per case, and, perhaps, a shade better price. The less padding the better, from a buyer's point of view. Keep every layer and row uniform in size through the case. When the case is filled the fruit should project slightly above the top of the case. Put a folded chaff-bag, or, better still, a padded board, on top of the fruit, then "dump" it gently. If you use a chaff-bag, or bran-bag, put a wide lid or board over it to hold the fruit down while dumping. This will cause the fruit to settle. Cover with paper-shavings or wood-wool, fold the ends of the paper lining down over the padding, and nail up with about four nails at each end of lid.



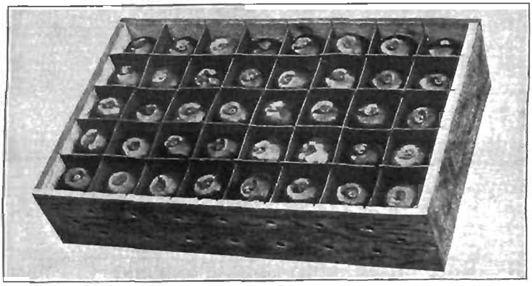
STANDARD EXPORT CASES, SHOWING FRUIT PACKED WITHOUT LINING.

Pears in trays must be packed sufficiently tight to preclude any possibility of their rolling about, and it must be also observed that the stalk of each pear does not injure its neighbour. Grapes are somewhat difficult to pack, as the cork-dust has to be well sifted down in between the individual grapes. Experience will teach exactly how to do this. Pears and grapes are not such reliable carriers as apples, but some excellent results have been gained. It is generally conceded that some more scientific method of carriage or preservation will have to be discovered before a large export trade can be done with these and other delicate fruits.

CASES AND BRANDING.

CASES.—The size of the cases used for the export of fruit is regulated by the Victorian Fruit Cases Act. This Act demands that the standard export case shall measure 18 x 14 x 8⅝ inches (inside measurement) and shall have no inside partition. A case of this size will contain an imperial

bushel. Only new cases are allowed for the export of fruit from Victoria. No allowance for shrinkage is made in cases used for export. A new case should measure 2,236½ cubic inches; the timber should be well seasoned, free from colour, odor, and moisture, and the case must be legibly and durably marked on each end of the outside with the maker's name and address and the words "Guaranteed by the maker to contain



BRADLEY'S PATENT SAFETY EXPORT FRUIT-CASE.

one imperial bushel." These words must be enclosed within a space measuring not more than three inches in length by one and half inches in width. A smaller case measuring 18 x 8⅞ x 7 inches (1,119 cubic) by inside measurement (without divisions) is also allowed for shipment, but *it is not expected that many exporters will use these. For pears one of* the most successful methods yet adopted has been that of packing the

PATENT CASE, WITH CARDBOARD PARTITION TURNED BACK TO SHOW DIVISIONS.

fruit in trays, one layer in each tray. Three of these trays are then cleated together to make up a single package. Another method, which has given splendid results, is that of exporting pears (also apples and even soft fruits) in the patent cases invented by Mr. S. A. Bradley, of King Street, Melbourne. In these cases, as may be seen by the illustration, the fruit is packed in cardboard divisions. The cases are ingeniously con-

structed to carry any size of fruit, which they automatically grade. Every separate fruit has a cardboard partition to itself, so that one cannot injure another by undue pressure. Each case contains two or more layers of fruit, which are divided by a sheet of perforated cardboard. In these cases the fruit is not wrapped. Ventilation holes are bored through the cases and cardboard shelves, thus conveying air through each layer and reducing the tendency to sweat to a minimum. Fruit packed in such patent cases, or in trays, are exempt from the restrictions of the Fruit Cases Act, provided that each of the trays or patent cases is legibly marked with the weight or number of the contents.

Cases for all fruit should not be air-tight but should be made so as to allow the air to circulate freely through the interstices and permit the escape of the moisture of evaporation. The dryness of the case is of the first importance. The use of green or improperly-seasoned timber is no doubt responsible for much of the loss caused by damp rot.

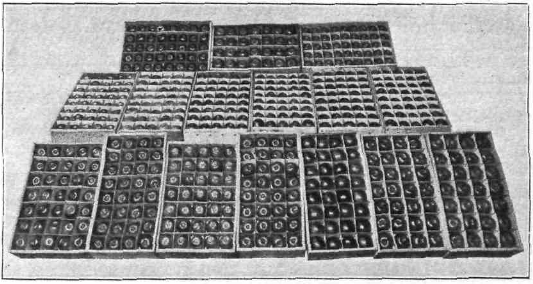


EXHIBIT OF FRUIT IN PATENT CASES.

BRANDING.—Under the Regulations of the Commerce Act cases must be branded with the following information :—The name of the fruit contained in the case ("Apples" or "Pears," or such description as the contents may warrant); the quantity; the name of the grower or exporter or his registered brand; the name of the State where grown; and the word "Australia." Additional information, such as the variety and the size or grade of the fruit, is optional. The address of the grower may be included also, if desired. The whole of the brand, as demanded by the regulations, must be marked on one end of the case (as shown in the illustration). The brand may be marked also on the other end of the case, or the port mark or consignee's brand may be substituted; but this is a matter which may be left to the shipper or his agent. There is much difference of opinion as to the best method of marking cases so that they will be handled as little as possible. Nearly every shipper holds different views on this matter. But whatever is done, one thing is certain :—The case must be marked at one end with all the information demanded under the regulations.

Should the shipper use his own name, or his name and address (such as "John Smith, Doncaster"), there will be no necessity for registration;

but should he desire to use a brand (such as shown in the illustration) it will be necessary for him to register the same. Application has to be made to the Comptroller-General of Customs for the registration of brands, and only brands which have been registered as trade marks under the State or Commonwealth Act are eligible for registration with the Comptroller-General. When making application, it is advisable to quote the number of the registration, so as to facilitate checking. It is urged that *different brands should be placed on fruit consigned to different ports, or to or through different agents, otherwise mistakes are frequently made at the port of discharge in parcels reaching the wrong agent or consignees.*

For branding, the use of a neatly-cut stencil is recommended, so that the brands will be uniform throughout. Do not paint the brands on with a brush, or paste labels on your cases. These methods are crude and unsightly. The neatest brand is that which is machine-printed on the case-end by the maker. See that the word "Apples" or "Pears" is plainly shown on the end of the case. The importance of this will be seen when it is pointed out that *pears are usually stowed under different conditions to those provided for apples.* It is therefore necessary that the stevedores and others may see at a glance the description of the goods they are handling. Many growers, who have seen and appreciated this, additionally mark the word "Pears" on the lid of each case.

Loading at the Railway.

The "louvre" or "U" type of truck is the one usually provided for the carriage of fruit. Until our growers, or their co-operative associations, are able to run their fruit out from their own refrigerating-chambers, or our railways provide cold storage depôts and iced trucks, the louvre truck will be the best means of conveyance of fruit from the orchard to the seaboard. There is another known as the old "H" truck, which, although very unsatisfactory as a vehicle for the conveyance of fruit, is nevertheless far better than the open truck covered with black tarpaulin. Open trucks should never be used for fruit carriage. The fruit becomes quite hot and steamy under the tarpaulin, moisture follows, and the wrappers get soaked. Consignments have arrived in trucks with water covering the floor owing to the unsound condition of the tarpaulins. The result is that the ship's engineer refuses to take the fruit, and the consignment is sent back for local sale.

Growers, at times, have complained that their fruit has been badly damaged in transit by rail. This is nearly always due to bad stowage in the trucks. It cannot be too strongly urged that cases should be so stacked that bumping of the trucks will not throw the top cases to the floor. Stow them so that they will present a level face all over the bottom of the truck; or, if this is not practicable, build them up in "steps" from the ends of the truck to the door. Never stow in high stacks in the trucks without providing for possible falls.

Stack pears as near the door of the truck as possible, so that they may be set aside at the boat for special storage. Consignments intended for different boats should be kept apart as much as possible and the details of each shipment noted on the railway waybill. When furnishing details to the railway station officials it should be insisted upon that the quantities of each fruit by each steamer should be noted on the waybill. For instance, "S.S. *Mongolia*, 200 cases Apples, 50 cases Pears; S.S. *Somerset*, 300 cases Apples, 50 cases Pears." If this be not done no end of vexation, delay, and perhaps loss, will be occasioned.

WHEN TO EXPORT.

The first fruit-carrying steamer usually leaves about the middle of February, and is followed by the regular mail-boats every week, with extra steamers every few days at irregular intervals up to the beginning of May. After then it is not good business to send fruit, for the soft fruits begin to come in on the London markets, and apples could not find any but the poorest of prices against them.

MISCELLANEOUS.

COST OF CASES, ETC.—Inquiries are constantly being made by intending shippers, as to the total cost of packing, shipping, selling, &c., of fruit sent from this State to London. At the present time the cost may be stated roughly at 5s. 3d. per case. This is worked out as under:—

Cases, best kauri planed ...	.. per case ..	1s. 1d.
Wrappers	... .	1d.
Grading, packing and nailing	... .	2d.
Rail freight	... .	3d.
Ocean freight	.. ..	2s. 10d.
Insurance and commission	... .	7d.
Supervision	. .. ...	3d.
Total ...	... per case ...	5s. 3d.

It will be noted that there has been a considerable advance in the cost of cases. This is due, so the case makers say, to the operation of the tariff and the recent increases of pay granted under the Wages Boards. The above charges, however, are capable of slight reduction here and there. For instance, rough pine cases may be obtained for at least 1d. less. By using our native hardwood, the cases may be put up for 3d. less; by obtaining them at the forest sawmills a saving of 5d. may be made. Should the grower decide to use the local hardwood, he must insist upon well-seasoned timber being used in every case. The charges for ocean freight, as shown above, are those quoted by the "Blue Funnel" line and the regular mail steamers. These latter boats provide for carriage and delivery under a fixed weekly time-table, with obvious resultant advantages. By shipping per certain outside liners a saving of 4d. per case may be gained. Further reductions are promised, in the near future, under the new Federal contract. The item "supervision," given in the above list, refers to agents' charges. This may be cut out altogether if the grower attends to his own work of forwarding, writing out export entries, notifying Customs officials and Inspectors, &c., &c. Many growers have tried to do this, but the result has not been too satisfactory and they have, after the first shipment or two, abandoned it in favour of the agent who makes a speciality of the work.

GRAPES.—It will be noted that but little reference has been made to fruits other than apples and pears. These fruits have given the best results, so far. Grapes have not been sent in any quantity of late years, and are not likely to be until some better system is devised by which they may be landed in such condition as will command higher prices than have formerly ruled. It is regrettable that only limited success has attended our efforts to place grapes on the London market in sound condition, for, at the time of the year Australian grapes would reach the English market,

they would suffer little from competition. Expensively-grown hothouse fruits are used on the tables of those who can afford to pay fancy prices. Cork-dust, so far, has proved the best packing material; it is absorbent, dry and very light. Experience has shown that the best method, yet adopted, is that of packing the bunches in cork-dust, well shaken down between the berries. In a report furnished by a London firm of fruit-agents, the use of barrels containing from 40 to 50 pounds of fruit has been tried and found very effective. The best grape for export purposes is the White Almeria or White Daria. Some measure of success has been met with in forwarding Doradilla, Raisin des Dames, Waltham Cross and Red Prince.

PASSION FRUIT.—The recent successful landing of passion-fruit at London should prompt our growers to send more of this most delicious fruit. Trade should commence in a small way, with say, two or three consignments in the first season. As the fruit is not yet too well known in the United Kingdom it will require writing up and pushing to work up what is bound to become, in time, a big business. Those experts who have tasted our Victorian passion-fruit state that they are unequalled for flavour, size and appearance, and compare favorably with any grown in any part of the world. These fruits will carry in ordinary export cases. Each fruit should be wrapped to prevent the spread of any decay, but for trial shipments, growers should pack in different ways, in order to find out the best methods of carriage.

CITRUS FRUITS.—Citrus fruits sent to London from this State have, so far, had no success worth speaking of. Nevertheless, the success of the Italian and American growers in landing oranges and lemons on the Melbourne wharf after a journey of several thousand miles shows that it is possible to carry citrus fruits in perfect order. Similar fruits have been received, from China, in trays and ordinary cases in perfect order. It seems from observation of these consignments, that the essentials to success are:—Send only prime, thin-skinned, well-cured fruits, wrap each in dry tissue-paper and pack in boxes or trays so that the contents will not be shaken about. Experimental lots might be also sent to the United States. In May last, oranges were selling up to 14s. 6d., and lemons 21s. per case, at San Francisco. Oranges should arrive in London from about the middle of August until the end of October. Lemons are not so likely to be payable as oranges, because of the regular supplies of stored fruit in large quantities and at low rates.

SOFT FRUITS.—Soft fruits, such as peaches, apricots and plums, have not yet been exported in sufficiently large quantities to enable us to assert that their carriage is beyond the experimental stage; but some remarkable results have been gained by the use of the patent cases before-mentioned. During the season of 1905 peaches sent to Vancouver and Seattle, in Bradley's cases, realized 11d. per pound; plums brought 10d. per pound and William's pears were sold at 16s. per case of 22 pounds weight.

CONCLUSION.

See that the highest standard of quality is maintained throughout every season; remember that one inferior consignment will do more damage to a grower's reputation than a whole season's effort will efface; ship consignments under as few brands as possible (one preferably) and do not change your brands; co-operate and thus save expenses at this end; concentrate and save expenses at the other end.

INSECT PESTS IN FOREIGN LANDS.

THIRD PROGRESS REPORT BY MR. W. W. FROGGATT, F.L.S.

(*Continued from page 720, Vol. V.*)

Washington, D.C., U.S.A.,
13th October, 1907.

I have the honour to forward a progress report of my movements and work since I left California on the 17th of September last. I found that it would be quicker and cheaper to come straight across to Washington than to come *viâ* Texas, as I had first proposed, particularly as I could easily see the cotton weevil work on my road to Mexico.

I arrived here on Sunday morning, 22nd September, and on Monday went up to the Agricultural Department, where I presented my credentials to Dr. L. O. Howard, Chief of the Staff, and had a long talk with him about the most advantageous way of spending my time and seeing the inner working of all the divisions and branches into which the Department of Agriculture at Washington is divided. Through his kindness, I have been enabled to go about and interview all the officers and see the methods they adopt in breeding specimens, and in looking after their specimens, books, and materials.

There are over 10,000 persons in the Department of Agriculture at Washington and scattered through the Federal offices in the United States; there are 300 in the Entomological Division, and in the Plant Pathology and other groups of this division under Dr. Galloway there are seventy botanists at work. Each of the leading entomologists under Dr. Howard is a specialist on a certain group of insects; thus—Dr. Hopkins deals only with forest insects; Professor Webster, with insects infesting field crops; Marlatt, scale insects and the best methods of dealing with them; Quantance, with those on fruit-trees and truck crops; and Banks, with ticks and animal parasites, and so on; therefore, they can get through a great deal of original work, besides answering correspondence. Besides this, also under Dr. Howard, there is a large staff of workers at the National Museum, each being in charge of a different group of insects. With all these officers I have spent some time, and they have been very kind in placing all their information at my disposal. One of the greatest time-saving methods is the card catalogue system in all branches of work, even extending it to the collections.

I have specially inquired into the habits of all cosmopolitan pests and the methods adopted here and in other parts of the States, and the range of the insects, but will not enlarge upon it in this report, as it would take up too much of your time, but have recorded all my observations in my journal. The two species of fruit-flies found in the New England States are not known in the west or southern States. *Trypeta pomonella* is very common in the State of New York, and in some years damages as many apples as the codlin moth; but the commercial orchards are of very small extent, and very little is done to keep it in check. The same might be said of the cherry fruit-fly (*Trypeta cingulata*), which is common in cherries in the same districts. The climatic conditions and the neglect of orchards will not furnish us with any suggestions in our work of fruit-fly destruction. I have met Mr. Gilles, in charge of silk-work culture, a business that the

Department is introducing into the southern States. They supply the eggs, instructions, and mulberry plants free to any one who will take the business up, and then buy the cocoons from the growers at a little above market price, spin the thread in the Departmental workshops, and sell it to the silk manufacturers.

Bee culture, under Dr. Phillips, is another important branch, as there are over 500,000 bee-keepers in the United States. The bacteriologist in this branch would be very glad to get specimens of bee paralysis from Australia, and would acknowledge and furnish reports upon any specimens received; specimens of foul brood would also be interesting to him. They have here a special Fairbanks' scales, which will weigh from 400 lb. to ⅓ of an ounce, and on this they are testing a hive of bees to find out the "activities of a hive," and with regular observations, regularly recorded, expect to get some interesting results.

I spent a most interesting day in the division of Plant Pathology, where Dr. Galloway sent me round to all his officers; and, among others, I had a very interesting time with Mr. Swingle, who is interested in the dry-farming cultivation, and has travelled extensively in Asia and Northern Africa. He is very much interested in our western flora and edible shrubs and plants. Among other interesting questions he pointed out that it was not a spineless cactus that we want in dry countries, but such a spiny one that nothing will touch it until the spines are burnt off. A spineless cactus, he maintains, would never hold its own in desert country; everything, from the mice to the mules, would eat it out. He showed me a species (*Opuntia fulgida*) which is such a mass of spines when young that nothing can come near it; but the spines are so thick and dry that they are like matchwood, and this species grows a great quantity of fruit, that is a very valuable food to stock. He is also greatly interested in the cultivation of dates in the dry country, and thinks that we should also be able to grow dates commercially in Australia.

In the Investigation of Plants division, Mr. Collins went into the question of cotton and also maize, and said that some of the species obtained in the arid parts of Mexico will mature in three months, and they are carrying out extensive experiments in these "dry-lands'" varieties of maize. The germination of seeds is a special branch of this division, and the purity of all seeds sold in the United States is tested here. Miss Schofield, in charge, has all the seeds examined under the microscope, and the foreign seeds, inert matter, and seeds, all listed and determined.

With Dr. True, of the same division, I had some interesting conversations regarding the diseases of stock caused by native plants, and he informed me that "Loco" disease in the eastern parts of the Rocky Mountains round to Arizona and Mexico, is very similar in its effects upon stock, and horses in particular, to our "Darling Pea," and last year in some places as many as 75 per cent. of the horses in Arizona died from this disease, caused by eating several species of *Astragulus* and *Argullus*. Several species of wild lupins (*Delphinus*) also often kill large numbers of stock in the West, particularly sheep.

I also called upon Dr. Cobb, formerly Pathologist to the N.S.W. Department of Agriculture. He has a branch under Dr. Galloway, and is only just getting things together; he wished to be remembered to all the officers of our Department. Another morning was spent with Drs. Mueller, Dorset, and Hassell, who have charge of the branches of Bureau of Animal Industry and deal with much of the work undertaken

by our Stock Branch. The Biographical Survey deals with investigations as to the spread and range of useful and injurious birds and animals. In the absence of Dr. Merriman, Dr. Fisher took me through the offices and explained the trouble that they had in the north-west with the ground-squirrels, which destroy grass and crops, just like our rabbits. Poisoning with phosphorus or other mixtures is the chief method of extermination; but it has been stated that a few years ago a contagious disease sprang up amongst them, and in some places they all died out. Dr. Piper has been investigating this matter. The Bureau of Forestry was also visited, and the officers in that branch gave me much interesting information about their methods of dealing with the forest areas. Most of the United States forests are in the west and north-west, and consist chiefly of conifers. Replanting is not practised on a large scale, but the forests belonging to the Government are waste lands, much of them in the free-range districts. The free-range system has grown up into one of the greatest evils to settlement in the States. There are millions of acres for which the State gets no rent in the occupation of sheep and cattle men, who are eating out the grass and fighting among themselves to hold the land of which none of them have any right or title.

The Weather Bureau is also closely connected with the Department of Agriculture, as they issue warnings as to rain or frost indications that are carefully watched by fruit-growers, farmers, and others interested in agriculture. They issue two weather-charts every day. The observations are taken all over the States, from Edmonton in the far north of Canada to Porto Rico in the West Indies, and at 10.30 the same morning all these reports are tabulated and ready for publication.

Last week, 7th October, I went to Ithaca and visited Cornell University as one of the most typical agricultural colleges in the United States, where Professor Comstock showed me all their work, and the arrangement of specimens for their teaching work. Professor Slingerland showed me his methods of making lantern-slides and other work. Dr. Needham took me down to his marsh lands experiments, where all water insects, mosquitoes, and fish can be continuously observed under natural conditions, and the reclamation of marsh lands studied.

From there I went to Boston to study the work of the Gipsy Moth and Brown Tail Moth Commission. The State Commissioners have a force of 1,000 men engaged burning off underbrush, burning egg clusters, bandaging the trunks, and spraying the foliage of the infested forests. The State of Massachusetts votes part of the money, and each town in the infested districts has to tax itself so much per valuation of property, and at the same time the Federal Department has voted a sum to deal with the introduction of parasitic enemies of these moths in their native home (Europe), and thousands of such parasites are being liberated in these infested areas. The result of these parasites will be watched by the economic entomologists all over the world. I went over about 200 miles of the infested area with the State Commissioner. I have now arranged to leave on the 15th (next Tuesday) for Texas, where the Cotton Boll Weevil Commission is working, and after a few days' stay in the district of Dallas will proceed to the City of Mexico, *viâ* San Antonio, to investigate the Mexican Fruit-fly (*Trypeta ludens*) and its parasites, and, if feasible, shall forward consignments of infested pupæ direct to our Entomological Branch.

THE PROCLAIMED PLANTS OF VICTORIA.

(*Continued from page 26.*)

Alfred J. Ewart, D.Sc., Ph.D., F.L.S., Government Botanist; and J. R. Tovey, Herbarium Assistant

Common Horehound.

Marrubium vulgare, Linn. (*Labiatæ.*)

Stem rather thick, a foot and a half high, or more, with spreading branches, thickly covered with a white cottony wool. Leaves stalked, orbicular, soft, and much wrinkled. Flowers in dense whorls or clusters in the axils of the upper-leaves, small, of a dirty white. Calyx with ten small, hooked teeth. Upper lip of the corolla narrow, erect, and 2 cleft.

A native of Europe, Asia, and Africa.

An extract of this perennial odorous herb, is commonly used as a cough medicine. The flowers afford to bees nectar for a pale excellent honey, which is however not palatable to all tastes. In many countries the plant becomes a weed, and takes possession of large patches of pasture land, thus preventing the growth of more useful vegetation. It should be dug up before flowering, and the short stout root stock destroyed by quick lime or burning. Ploughing and summer fallows soon suppress it.

Proclaimed for the Shires of Maldon and Warrnambool.

AGRICULTURAL EDUCATION.

EXAMINATION RESULTS, FARMERS' CLASSES, 1907.

(*Continued from page 49.*)

H. V. Hawkins, Superintending Officer.

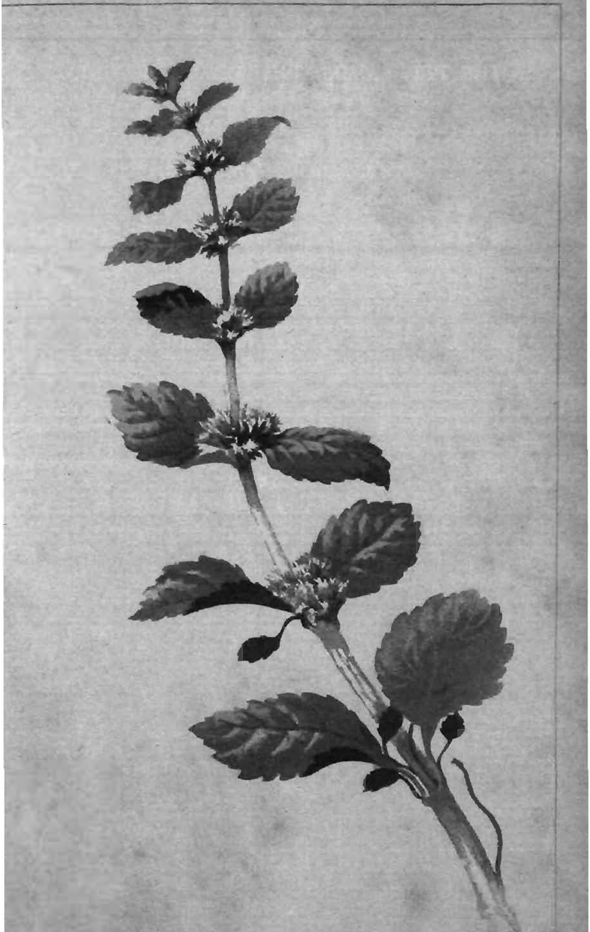
MILDURA.

Student's Name.	Colebatch.	Archer.	Paterson.	Hawkins.	Total.	Percentage.
Gair, C.	79	95	50	90	314	78.5
Chapman, F.	83	94	60	75	312	78.0
Beverley, E. P.	62	96	60	75	293	73.2
Voullaire, R. M. .. .	82	97	45	65	289	72.2
Adams, F. J.	85	94	40	60	279	69.7
McPherson, —	97	98	..	..	195	48.7
Downing, W. H.	87	93	..	..	180	45.0
Scott, L.	..	..	40	75	115	28.7
Garnett, S. W.	..	..	50	50	100	25.0

PENSHURST.

Student's Name.	Colebatch.	Archer.	Paterson.	Haile.	Total.	Percentage.
Farmer, W. W.	90	93	55	73	311	77.1
Linton, A. S.	18	71	50	75	214	53.5
Eales, E. T.	..	95	50	63	208	52.0
Mahony, J.	..	85	52	..	137	34.2

PLATE 21



MALDON.

Student's Name.	Lee.	Haile.	Paterson.	Hawkins.	Total.	Percentage.
Neilson, N. H.	40	90	52	85	267	66.7
Hodge, F. S.	30	63	55	90	238	59.5
Nelson, J. G.	50	80	..	80	210	52.5
Gunther, F. F.	20	75	50	55	200	50.0
Jones, A. E.	50	..	60	55	165	41.2
Mikkelsen, D. S.	75	85	..	..	160	40.0
Dickson, H.	60	93	..	..	153	38.2
Lillie, T. W. M.	35	71	..	..	106	26.5
Dennis, R. H.	..	90	..	..	90	22.5
Lillie, R.	..	85	..	..	85	21.2
Parkin, C. H.	..	78	..	..	78	19.5
Dennis, F. H.	..	78	..	..	78	19.5
Moynan, T.	..	70	..	..	70	17.5

MOORABBIN.

Student's Name.	Lee.	Archer.	Paterson.	Hawkins.	Total.	Percentage.
Rippon, E. E.	90	94	64	75	323	80.7
Turner, C. J.	78	87	50	78	293	73.2
Brough, H. W.	85	88	52	55	280	70.0
Judd, C. E.	77	90	50	40	257	64.2
Kingston, S. J.	80	93	46	30	249	62.2
Le Page, E. A.	55	85	55	50	245	61.2
Marriott, J.	55	88	50	50	243	60.7
Edwards, G. E.	30	75	48	70	223	55.7
Judd, O.	80	91	..	..	171	42.7
Brough, C. R.	70	88	..	..	158	39.5
Shields, J.	..	60	45	50	155	38.7
Marriott, R. H.	80	..	..	..	80	20.0
Brough, G.	70	..	..	..	70	17.5
Andrews, L.	20	..	..	..	20	5.0

REDESDALE.

Student's Name.	Colebatch.	Archer.	Paterson.	Ham.	Total.	Percentage.
O'Brien, F.	90	94	58	94	336	84.0
Bergin, Thos.	41	89	50	78	258	64.5
Gamble, D.	80	92	..	71	243	60.7
Took, J.	38	67	40	97	242	60.5
Gamble, C.	30	86	40	64	220	55.0
Lawrence, J.	..	..	55	95	150	37.5
Robertson, E. H.	58	82	..	..	140	35.0
Gibbard, —.	52	86	..	..	138	34.5
Jeffrey, —.	50	80	..	..	130	32.5
Gooch, —.	62	65	..	..	127	31.7
Poole, G. J.	..	..	50	77	125	31.7
Hahn, J. R.	..	..	40	72	112	28.0

St. Arnaud.

Student's Name.	Colebatch.	Haile.	Paterson.	Hawkins.	Total.	Percentage.
Duggan, P. J.	81	93	50	62	286	71.5
Duggan, B.	60	88	54	75	277	69.2
Robbins, R. W.	70	87	55	60	272	68.0
Boyle, D.	64	88	45	50	247	61.7
McGregor, A. L.	57	79	45	58	239	59.7
Cunningham, H. J.	86	85	..	..	171	42.7
Gleeson, B.	58	91	..	..	149	37.2
Craig, H. G.	60	83	..	..	123	30.7
Duggan, J. F.	..	..	60	60	120	30.0
Vanrenen, H. B.	..	88	..	..	88	22.0

Seymour.

Student's Name.	Smith.	Dr. Brown.	Paterson.	Kenyon.	Total.	Percentage.
Conroy, J. F.	37	60	65	60	222	55.5
Bidstrup, E. O.	57	50	60	50	217	54.2
Bidstrup, W. J.	30	50	50	55	185	46.2
McNally, T. J.	55	42	48	25	170	42.5
Scott, A. C.	54	36	..	75	165	41.2
McNally, M.	37	44	40	20	141	35.2
Scott, S. A.	41	44	50	..	135	33.7
Porter, H. C.	63	44	..	..	107	26.7
Heywood, E.	..	40	45	20	105	26.2
Johnston, R.	40	56	..	..	96	24.0
Mooney, D.	43	50	..	..	93	23.2
Bready, J.	43	26	..	..	69	17.2
Wallis, F. H.	33	28	..	..	61	15.2
Newnham, W.	17	40	..	..	57	14.2

Sea Lake.

Student's Name.	Lee.	Dr. Brown.	Paterson.	Hawkins.	Total.	Percentage.
O'Bree, F. G.	79	54	75	75	283	70.7
Lockhard, Jos.	60	62	70	50	242	60.5
McClelland, H.	75	34	50	63	222	55.5
Cosgrove, W.	45	48	60	52	205	51.2
Porter, A.	40	42	50	70	202	50.5
McLennan, M.	55	30	50	65	200	50.0
Hanns, John	45	56	45	45	191	47.7
Blythman, A. J.	30	44	40	50	164	41.0
McClelland, A.	45	34	..	20	99	24.7
Sutcliffe, R. E.	40	30	..	20	90	22.5

STAWELL.

Student's Name.	Lee.	Haile.	Paterson.	Hawkins.	Total.	Percentage.
Whitehead, W. A. ..	80	78	85	50	293	73.2
Brewster, A. C.	50	83	60	80	273	68.2
Ricketson, S.	75	61	52	65	253	63.2
Taylor, R. B.	60	89	48	52	249	62.2
Brownscombe B.	40	74	45	75	234	58.5
Falls, N.	50	65	48	55	218	54.5
Barr, J.	65	43	51	40	199	49.7
Smith, A. C.	60	74	..	..	134	33.5
Rutherford, H. L... ..	85	35	..	..	120	30.0
Grieve, Mrs. F.	..	..	..	85	85	21.2
Munt, A. B.	..	..	..	80	80	20.0
Sinclair, C.	35	40	..	..	75	18.7

SWAN HILL.

Student's Name.	Smith.	Archer.	Paterson.	Hawkins.	Total.	Percentage.
Rees, F.	60	91	65	75	291	72.7
Lowrie, J.	57	79	..	40	176	44.0
Jones, R.	70	91	..	..	161	40.2
Lowrie, J. P.	60	..	48	45	153	38.2
Barker, H.	53	85	..	..	138	34.5
Nisbitt, J. E.	49	88	..	..	137	34.2
Nield, W. J.	..	..	55	70	125	31.2
Long, G.	41	82	..	..	123	30.7
Hyland, P.	45	73	..	..	118	29.5

TRARALGON.

Student's Name.	Smith.	Archer.	Paterson.	Dr. Brown.	Total.	Percentage.
Lindsay, G. A.	80	96	52	55	283	70.7
Nicholls, A. C.	65	91	62	55	273	68.2
Dunbar, J. F.	70	84	60	56	270	67.2
Thornton, R.	..	96	75	80	251	62.7
Christensen, H. A. ..	55	90	48	54	247	61.7
Thompson, A. E.	53	94	45	48	240	60.0
Galbraith, B.	35	97	50	55	237	59.2
Moller, C. C.	33	93	51	42	219	54.7
Timbs, A.	45	80	45	40	210	52.5
Galbraith, W. P.	37	81	48	42	208	52.0
Guyatt, H. A.	40	80	40	46	206	51.5
Medew, R.	..	96	60	48	204	51.0
Hinschell, F.	30	83	50	35	198	49.5
Dunbar, B.	..	90	47	58	195	48.3
Birmingham, J.	55	87	55	50	192	48.0
Pentland, E.	40	60	45	30	175	43.7
Pentland, H.	23	82	30	35	170	42.5
Hinschell, R.	25	65	40	30	160	40.0
Pentland, G.	15	50	30	30	125	31.2
Faulkner, M. J.	12	35	35	32	114	28.5
Thompson, R.	95	..	..	..	95	23.7
Molan, R. S.	67	..	..	..	67	19.2

NOTE.—Two papers unsigned omitted from list.

TUNGAMAH.

Student's Name.	Smith.	Dr. Brown.	Paterson.	Kenyon.	Total.	Percentage.
Gemmell, A.	79	65	88	90	322	80.5
Young, T.	69	50	80	85	284	71.0
Stevenson, C.	72	48	60	75	255	63.7
Bicket, D.	70	40	50	85	245	61.2
Lucas, E.	57	44	70	65	236	59.0
Bicket, M.	61	46	57	60	224	56.0
Lee, J. H.	55	38	45	85	223	55.7
Gemmell, E.	31	46	50	80	207	51.7
Bicket, W.	53	46	52	50	201	50.2
Pickard, J. T.	41	42	60	20	163	40.7
Tomlinson, S.	21	40	50	15	126	31.5
Edis, A. E.	73	46	..	..	119	29.7
Dickie, W., jun.	60	44	..	..	104	26.0
McAlpine, J.	27	28	..	..	55	13.7

WARRAGUL.

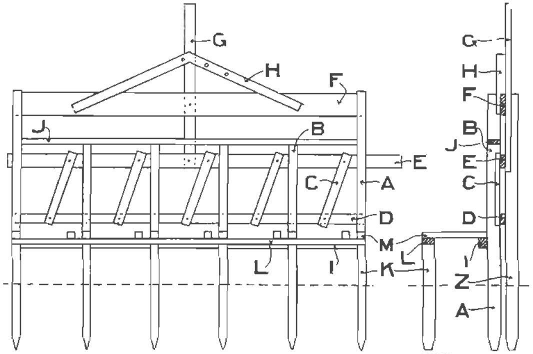
Student's Name.	Smith.	Archer.	Paterson.	Ham.	Total.	Percentage.
Evans, W.	78	84	40	92	294	73.5
Fuhrmann, F.	72	81	60	81	294	73.5
Borland, G.	74	72	50	91	287	71.7
Lloyd, L.	69	67	55	84	275	68.7
Kelleher, E.	43	80	50	78	251	62.7
Kelleher, J.	56	82	35	71	244	61.0
Wheeldon, W. J.	67	75	..	..	142	35.5
Grove, L.	..	..	40	78	118	29.5

YARRAM.

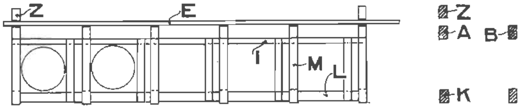
Student's Name.	Lee.	Archer.	Paterson.	Ham.	Total.	Percentage.
Hobson, A. W.	93	91	56	94	334	83.5
Lang, W. B.	91	95	50	90	326	81.5
Hobson, E.	60	93	50	91	294	73.5
Hobson, F. E.	60	96	50	87	293	73.2
Lang, N.	55	81	47	68	251	62.7
Bland, W. G.	50	89	35	58	232	58.0
Smith, H. D.	80	94	..	..	174	43.5
Bland, H. A.	75	86	..	..	161	40.2
Ford, G. J.	65	94	..	..	159	39.7
Steele, A. G.	65	88	..	..	153	38.2
Ray, A. J.	50	91	..	..	141	35.2
McKerrow, C.	50	88	..	..	138	34.5
Engblom, C.	60	73	..	..	133	33.2
Marks, F.	50	70	..	..	120	30.0
Gellion, J.	..	..	40	57	97	24.2

A SIMPLE SET OF CALF BAILS.

The accompanying drawing is that of a set of calf bails designed and in use by Mr. W. H. Dunstan, Superintendent of the Church Training Farm, Apollo Bay. There are five bails which are placed along the fence of the calf paddock; this arrangement enables the attendant to feed them from the outside, and his clothes are in consequence kept freer from dirt. The calves all obtain a given quantity of milk, and they are also prevented from knocking over the buckets. They soon learn to go in readily when the buckets are placed in position. After feeding it is advisable to leave them in the bails for about ten minutes and then they will not contract the habit of sucking ears.



FRONT VIEW. SECTION.



PLAN.

As will be seen from the sketch and the following details, the construction is simple and the bails may be easily extended as occasion demands. The work of erection may be carried out in about three or four hours. The uprights marked A consist of 5-feet lengths of 3 x 2 driven 15 inches into the ground; immediately behind these are the posts Z which are of the same dimensions. The B's are 4 feet long and are driven in a similar distance about 14 inches apart; J is nailed on posts B. C is fastened with 4-inch nails (clinched) to rails D and E, whilst D is nailed to posts A. E is allowed to slide between posts A and Z. F (6 x 1) is nailed to A, G lever, H stop to hold lever. The frame (I) is made by driving short posts (K) in the ground about 1 foot in front of bails; 3 x 1 lengths (L) with cross pieces (M) to fit the buckets are nailed to the short posts.

THE KEEPING OF MILK AND ITS RELATION TO FLAVORS IN CHEESE.

J. G. McMillan, N.D.D., Cheese Expert.

LOCATION OF FAULTS.

During the past spring and in fact up to the moment of writing there have been more complaints amongst cheesemakers about bad flavors than there have been for years past. Even from dairies where bad flavors were seldom known complaints come to hand. To what the faults are attributable is in some instances invisible to the naked eye cleanliness being observed as strictly as in previous years. The fault must, therefore, be due to some abnormal conditions.

Bad flavors are mainly due to uncleanliness, diseased cows, cows in season, feed, water supply, and the addition of colostrum or beestings. The first milk which the cow gives is commonly known as beestings. This differs, principally, from ordinary milk by the excessive percentage of albumenoid matter which constitutes about 20 per cent. of the total constituents; the water being also of a much lower percentage. At time of parturition this substance is of a reddish-yellow color and has a viscous and slimy consistency. Gradually this sliminess disappears varying with different cows from 4 to 6 days, in some cases as much as 10 days, before becoming normal. The milk from a newly-calved cow should not be sent to the factory until it will stand boiling without thickening. If it thickens it is unfit for cheese or buttermaking purposes. To keep such milk back is no waste as it can be profitably given to the calf being specially suited for the digestive organs of the newly-born animal. Its use strengthens the digestion adapting the organs gradually to a change of diet consisting principally of skim milk or whey or their mixtures. The beestings of one cow will contaminate a whole vat of milk resulting in bad cheese or butter.

There are other diseases of milk which are sources of trouble. Red milk, for instance, may be caused by some disease in the cow's udder or through the action of a certain organism (*Bacillus prodigiosus*). Red milk due to trouble in the udder may be distinguished from that caused by bacterial action by placing some of the milk in a test tube and allowing it to settle for some time. When due to the former cause small blood particles will settle at the bottom of the tubes but when due to the latter cause small red spots will appear on the surface.

Blue and yellow milk are occasionally found and each fault is due to bacterial action, but are dependent on certain conditions for their development.

Ropy milk is sometimes come across but it is a matter for gratification that we have but little of it. In the making of Edam cheese a culture of the organism which produces this condition is desired but for butter or the making of ordinary Cheddar cheese it is a most undesirable milk to have. When the finger is inserted into ropy milk and drawn out it draws away in threads almost like syrup. This trouble is due to bacterial action and may be caused by diseased udders. There is, however, a certain plant, (*Pinguicula vulgaris*) commonly known as butterwort, found in Norway and occasionally in Great Britain, which when fed to cows or the leaves placed in milk produces stringiness. When slimy milk occurs a considerable quantity of lactic acid should be developed previous to

adding rennet by the addition of starter. Lactic organisms destroy those of the ropy milk.

Bitter milk is often come across and may be due to bacterial growth or to some undesirable food consumed by the cows. If to the latter cause the taste is noticeable immediately after the milk is drawn but if due to the first mentioned cause the flavor develops on letting the milk settle. Bitter milk is found frequently in cold weather particularly when cheese-making is conducted on alternate days or at infrequent intervals. The excessive low temperature seems to favour the development of some organism that produces bitterness. It is better to keep milk at a temperature tending to favour the action of the lactic organism as it has been found that those kinds of organisms do not produce bitterness when the milk shows an acid reaction; 60 degrees Fah. is a most suitable temperature.

Milk from cows a long period in lactation often causes trouble through being of an alkaline or salty nature. With such milk a bitter cheese is produced and as the milk often contains a larger percentage of dirt the development of lactic acid is retarded and the conditions rendered more favorable for other organisms. The use of milk from sick cows cannot be too strongly condemned. When a cow declines in health the quantity as well as the quality lowers. Different diseases are said to affect the milk in different ways and it is well understood that a derangement of the digestive organs has a marked influence on the flavor of milk. Cows that do not clean well after calving secrete milk with a bad taste and when they are in season the milk not only decreases in quantity but assumes a very disagreeable flavor. When any quarter of the udder contains matter on no account should the milk be added to the rest of the milk. Only quite recently I traced a fault in a cheese factory to a dairy where one cow gave a milk which produced a spongy curd. The cause was due to a slight injury to the udder. Another cow in the same dairy gave a milk on which rennet would not act, and which when kept back did not turn sour for several days although the temperature was high. The milk of both these cows was kept out of the cheese vats with beneficial results. When it is known that any cows give abnormal milk they should be the last to be milked in the herd for, unless the buckets are washed after such cows are milked, contamination is likely to occur. These troubles are not easily noticed by merely taste or smell but the tracing of same can be easily done by a method known as the Wisconsin Curd Test which will be explained further on.

The feeding of the animals is fairly well under the control of the dairyman. It may be said that the cleaner the pastures the purer the milk supply, other conditions being equal. Every effort should be made to eradicate Cape Weed, Camomile, &c., which are very injurious to the flavor. Lucerne should not be fed to the cows in the green state but should be cut and then allowed to wilt for 24 hours. Foods that may have a tendency to convey bad flavors, such as turnips, ensilage, and cabbage, should be fed immediately after the milking process is completed. Some authorities are of opinion that when cows are fed on growing lucerne or clover for about an hour after milking, and not allowed to lie down amongst the food that no taint will be conveyed to the milk.

The water supply is of course of vast importance and every precaution must be taken to keep this pure. Where dams exist they should be fenced so that the animals can drink without standing in the water. There

is no better arrangement than a windmill and trough unless a supply can be obtained by gravitation.

We have touched on faults which are not altogether due to or under the control of the dairyman. We, however, come to a subject the non-observance of which is the principal cause of faults and over which the dairyman has absolute control, viz., cleanliness. No dairyman can put forward a defence on this point. There is not the least doubt that most cases of trouble are due to carelessness with regard to this important matter. A few weeks ago I had occasion to visit a cheese factory and never at any time have I come across such filth. Many cans were in quite an unfit state for the conveyance of human food. What is the cause of such a state of affairs? Carelessness combined with ignorance regarding the proper method of how to clean utensils and the proper utensil to use. How often will one visit a dairy without seeing that handy receptacle—the kerosene tin? Though such a useful article it is quite unsuitable for this purpose. The dairyman asks, Why? The reason is that utensils used for milk should have the seams filled up with solder or be free from seams entirely. The latter kind made out of blocked tin are on the market and are very durable. The kerosene tin has none of these desired qualities the seams being perfectly open and simply a harbor for organisms. Even scrubbing and steaming will not cleanse them properly. Rusty cans and buckets should be discarded as rusty parts cannot be properly cleansed and are breeding grounds for bacteria. Any dairyman who doubts this should take two cans, one rusty and the other free from rust. Give them the same amount of cleansing, add to each an equal quantity of milk that has been previously cooled, maintain under exactly same conditions, and await results. Not only will the milk in the rusty can "turn" first but it will take up a bad flavor as well. When whey is taken back to the farm the case will be still more glaring. Let all dairymen try little experiments like this and they will soon learn the evil effects of uncleanliness.

It is evident that many people who handle milk do not know how to clean utensils properly. The absurdity of first scalding and then washing with cold water must be evident to any one who considers the question. By the first operation the albumen of the milk is fixed on to the sides of the can whilst the bacteria may be destroyed and by the second operation larger numbers of bacteria will probably be added through the use of contaminated water. Immediately after use, milk buckets and cans should be rinsed out with either tepid or clean cold water. Hot water containing soda (1½ lb to 20 galls.) is then added and the utensils given a thorough wash, a scrubbing brush and any amount of elbow grease being used. The brush used should not be worn to such a condition that it will not get properly into the corners. After this scrubbing which includes the outside of the utensil as well, the bucket or can is subjected to steaming by placing it over a jet for about half a minute. When steam cannot be obtained boiling water must be used. Every farm, however, should have a steamer which can be obtained for about £7 or £8. These are always useful for steaming pig or calf food and the housewife will also find such an article very useful. After the cans are scalded they should not be dried with a cloth but placed mouth downward on a table with laths several inches apart and the moisture will drain out. The table should be in a clean situation and exposed to the sun.

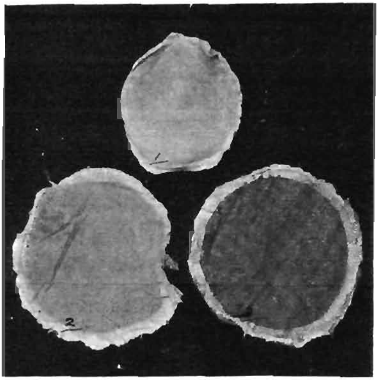
Where milking machines are used they must be washed after each milking and subjected to a thorough scrubbing, with special brushes for the purpose, in scalding soda and water. There is hardly a doubt

but by the use of milking machines a cleaner milk is obtained if proper care is taken, but when carelessness is practised, one of the most ingenious and useful dairy appliances of recent years may be unjustly condemned. As much attention should be given to the washing of the cows' udders as when hand milking is practised and each quarter must be tested for soundness before placing the cups on the teats. Manufacturers and agents of milking machines should put special stress on this important matter, viz. cleanliness, being carried out. I believe that a weak solution of formalin or even permanganate of potash run through milking machines will tend to keep them sweet. Good rubber is of course essential and it is certainly a penny wise and a pound foolish policy for any firm to supply a customer with rubber of inferior quality. Bad rubber soon takes on a slimy condition rendering it difficult to clean and conveying to the milk a foreign flavor. Although formalin and potash are recommended for cleansing machines I would not recommend their general use, but I would prefer them to any other disinfectant except lime wash. A manager of a factory not a great distance from Melbourne had occasion to complain about the state in which milk was being delivered. Like a wise man he made a personal inspection of all the sources of supply. One good lady was considerably annoyed that the milk from her dairy should be suspected of dirt. On being asked how she cleaned the cans she explained that she rinsed them out with cold water and afterwards with water containing phenyle. Needless to say it was an easy matter to know how that milk had a flavor. I do not wish to discourage the use of phenyle; dairymen can use it in small quantities in the cow yard but they must keep it from coming in contact with the milk. When a disinfectant is required it is hard to improve upon lime which can be used in the form of lime wash or in its dry state. By sprinkling lime over a well washed cow yard, everything is kept in a sweet condition.

Our subject has now embraced the question of cleansing utensils and it now behoves us to touch the question of keeping milk clean. The udders of the cows must be washed and dried at all times and the hands of the milkers likewise between the milking of each cow. Many think that this is unnecessary and a waste of time. True, a few minutes may be taken up by this. But what does that matter when the production of a better article is concerned. It is very questionable if the process of milking is prolonged as there is no doubt but that added energy is given to the muscles with the cold water which should be obtained direct from the tap. In the *Journal* for June, 1905, there is an illustration of an excellent appliance. It consists of an oil drum with a tap attached and the milker is seen washing his hands. The dirty water is allowed to escape thus insuring a constant clean supply.

Immediately after the cow is milked the bucket should be emptied into whatever receptacle is desired. The milk must of course be strained. The matter of strainers is of the utmost importance and those generally found in use are practically useless. Such are generally constructed with wire gauze at the bottom, the gauze being of such a mesh that looks as if intended to keep only flies out, dirt being a secondary consideration. To many I have illustrated the uselessness of these strainers by tying a piece of cheese cloth under the wire gauze. After all the milk had been passed through the strainer they were more than surprised to see the residue on the cloth and which would, under ordinary circumstances, have gone into the milk. This is another little experiment the dubious dairyman might profitably make. The fault of the wire strainer is that as each bucket of

milk is poured in it washes through any sediment that may have been caught from the previous one. At no time is the small sediment caught. Now, what is the best strainer? We have on the market strainers with certain filtering attachments and after the milk passes through it is almost pure. For those who do not care to go to the expense of such a strainer I would strongly recommend the use of three or four thicknesses of cheese cloth or one layer of flannel or good linen. These are tied in the form of a bag over the ordinary strainer or on a framework of wood. The cloths should be washed and boiled immediately after use and if inclined to smell should be discarded.

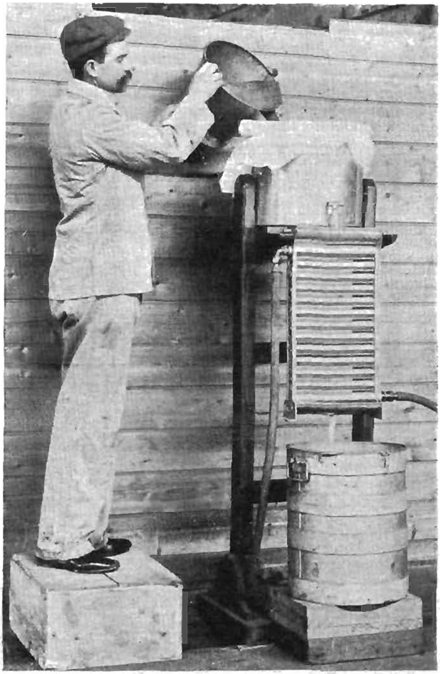


NECESSITY FOR STRAINING.

Fig. 1 is a piece of cheese cloth before use and Figs. 2 and 3 are discs through which 60 and 30 gallons of milk respectively have passed. It will be seen that the last is very much the dirtiest.

When the milk is strained the next matter is the keeping. There is no room for doubt but what the best method of keeping milk in a sound condition is that of running it over a cooler various kinds of which are to be found on the market. Not only does the cooling take place rapidly but the milk is aerated thus driving out obnoxious gases to a considerable extent. The advantage of quick cooling is obvious, every one knowing that the longer milk is kept at a high temperature the quicker it will sour and *vice versâ*. It is necessary, however, that this cooling process must be conducted in an atmosphere as free from dust as possible or the milk will take up a considerable amount of impurities while exposed in thin layers. As already seen the conditions may be made favorable for the production of bitter flavor. In addition to cooling the evening's milk it has been found that by treating the morning's milk likewise a larger percentage of cheese can be obtained. The matter of water supply is of vast importance. A dairyman of my acquaintance got over the difficulty by

obtaining two small tanks of about 400 gallons each. One of these was placed on the ground whilst the other was placed on a stand about 6 feet high. A cooler was placed in an intermediate position the water running through it from the higher tank into the lower. By means of a semi-rotary pump fixed on the lower tank the water was pumped from it into the higher and by the time it was required again had cooled down. This



PIPE COOLER AND AERATOR.

went on from day to day with the same water but fresh water could be used every day from an underground tank, the waste being drunk by the cattle. The milk was cooled only in the evening. Though the method was not exactly up-to-date it was most helpful to the cheesemaker.

The milk is often cooled by filling the cans half full and setting in a tank of running water. Some set them in a stream or creek but when this

is done the cans should be covered over, but not with lids, so as to prevent frogs or flies from gaining access. In cold weather it is not necessary to cool the milk. The cans should always be kept in a room where there is a good inlet of air and away from any proximity to bad smells, particularly those from pig styes. Pigs and fowls should not be allowed to come near the milk house, neither should it be utilised as a store for meat, eggs, &c. The milk waggon should be washed out frequently and should not be used for carting pigs. Night and morning milk should not be mixed.

DELIVERY TO THE FACTORY.

The milk supplier should reach the factory as early as possible and all factory directors should insist on supplies being delivered not later than 8.30 a.m. Particularly is this necessary in warm weather and it will also allow the cheesemaker to finish his work within reasonable hours. The cans should be covered with a white cloth to prevent the sun from playing on them. Damp bags round each can are of great value but these *must be clean* and not sour. The driver himself should have a clean appearance; a man with boots covered with cow dung and his hands also in a dirty state shows in what condition the milk is likely to be.

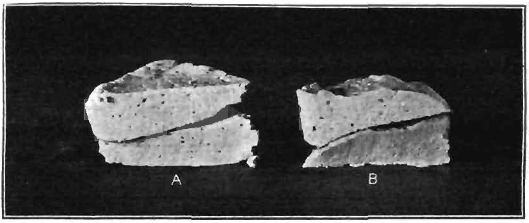
THE RECEIVING PLATFORM.

It is at the receiving platform that the manager or the head cheesemaker should examine every can of milk as it is delivered. It is to his

SAMPLES OF CURD SHOWING FAULTS. COMMENTS ON EACH SAMPLE APPEAR ON PAGE 95.

own benefit, the factory's benefit, and that of other suppliers, that he rejects all bad milk. By accepting an impure raw material he is penalizing the good suppliers and not improving the careless dairyman. By touching

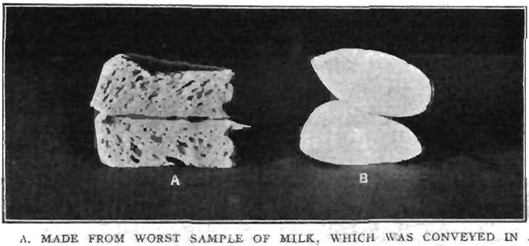
the pocket he effects the most radical cure. As well as seeing that the milk is sound he should examine the cans and lids which, if wrong, should receive his just condemnation. Even this attention, however, does not always give correct results. Sometimes the senses of taste and smell are deceived. The cheesemaker well knows that at times he will have a vat of milk, to all appearances sound, yet, when the curd is cooked there is a foreign smell which disheartens him. To ascertain the source of this smell he can call to his aid that simple though ingenious test viz. the Wisconsin



A. SAMPLE TAKEN FROM VAT BEFORE ADDITION OF MILK FROM WHICH SAMPLE B WAS OBTAINED. SHOWS EFFECT OF ONE CAN OF BAD MILK.

B. NO. 28, "SMELL VERY BAD; SPONGY; A DISGRACEFUL CURD."

Curd Test. The outfit can be bought at a fairly reasonable cost. When there are a large number of suppliers the expense would be proportionately increased. When directors begrudge such an outlay, another method though of a more crude nature can be successfully carried out. This consists in having as many jars as there are patrons, in fact a few more, in case of breakages. The ordinary Mason fruit jar, pint size, with screw top is

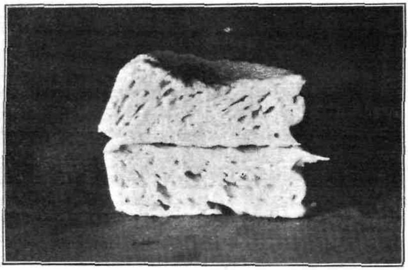


A. MADE FROM WORST SAMPLE OF MILK, WHICH WAS CONVEYED IN A CAN IN WHICH WHEY HAD BEEN RETURNED.

B. BEST SAMPLE; CAN WAS NOT USED FOR CONVEYANCE OF WHEY.

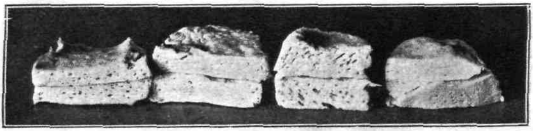
the best. The jars and lids must be thoroughly washed and sterilized immediately before use. The jars should be drained by inverting on a tin, dished towards the centre and perforated or fluted (the tins should be thoroughly washed and scalded). The lids must also be placed mouth

downward. When the bottles are properly drained the lids are screwed on tightly and placed in a position convenient to the milk lift. The samples are taken from each can with a long handled dipper, the milk being well stirred. The jars should be filled about three parts full and the lid immediately replaced and numbered. The dipper must be washed and dipped in boiling water after the sample from each supply is taken. If care in this respect is not exercised one milk may be contaminated through another and lead to the condemnation of an innocent supplier. When the samples are taken the jars containing same should be placed in water and brought to a temperature of 98 degrees Fah. It is not necessary to test



A TYPICAL SPONGY CURD.

all the samples for temperature—one or two will be sufficient. The same precautions must be taken with thermometer as with the dipper used for sampling before transmitting from one jar to the other. Ten drops of rennet are added to each jar, the contents being shaken so as to mix. The lids must be replaced immediately after all operations. When the milk is formed into a firm curd and whey showing it is cut into small particles with a sharp knife sterilized between each jar. When all the curds are cut as much whey as possible is drained off. To facilitate this process



SEVERAL OF THE WORST CURDS.

and prevent loss of curd it is a good plan to place under the lid a small cheese circle or a piece of clean butter cloth. The whey is drained off at frequent intervals, the temperature being maintained at 98 degrees Fah. In about 8 hours' time the contaminated samples will show, a bad smell being given off on the lids being unscrewed. The curds should then be in a fairly firm condition, and are emptied on a table slightly dished towards the centre. The samples are then cut in half with a sharp knife. A sound curd will be solid whilst an unsound one will be holey, the amount

of holes corresponding with the degree of unsoundness. The more holes the worse the sample.

The cheesemaker having found out the dairies from which all bad supplies come must make a personal examination of the premises paying particular attention to the milking, cleansing of utensils, state of cow yards and bails, water supply and feed. He should make a test of each cow in the same manner as samples taken at the factory. If there are only a few bad samples then the cows will be at fault, and he may look for some udder complaint. If on the other hand all the samples are bad then the cause may be attributed to surroundings, water, or feed. If he should find that though the samples are right when taken from the cow that the milk is "off" when received at the factory it is almost certain that the cans are contaminated or the milk kept in unsuitable surroundings. Bad samples from individual cows must not be mixed with good milk but should be fed to calves until it assumes normal conditions. The Wisconsin Curd Test can be carried out by the farmer using a little intelligence and care.

THE RETURNING OF WHEY IN MILK CANS.

This is one of the difficult problems connected with cheese factories. No doubt the system of carrying whey back in the same cans in which the milk was brought is responsible for much trouble. The risks can be reduced by scalding the whey at the factory immediately it is drawn off and also by scalding the tanks daily. The trouble can be got over by the dairyman having separate cans for the whey but there is rarely room in the waggon. Another remedy is for the supplier to have old casks and to make two trips but this reduces the value of a cheese factory. In New Zealand some factories will not allow the whey to be taken back in the milk cans. The man who can invent something that will overcome the difficulty will be a benefactor to the cheesemaking community. It will be essential, however, that factories compel every supplier to carry out any scheme that is adopted. There is no use of all but one or two doing it as it has already been shown how one bad lot will have an ill effect.

The accompanying illustrations show something that should be interesting. The samples were all taken at a factory and subjected to the Wisconsin Curd Test by the writer.

SAMPLES OF MILK FROM EACH SUPPLIER TO A CHEESE FACTORY TURNED INTO CURD AND TESTED BY THE WISCONSIN TEST.

No.	Remarks.
1.	Very bad smell; spongy; very bad curd.
2.	Smell rather strong; pinholey.
3.	Smell strong; pinholey.
4.	Smell fair; pinholey.
5.	Smell very bad, putrid; spongy, bad curd.
6.	Smell very strong; pinholey.
7.	Smell very strong; white mould; pinholey.
8.	Smell strong, like as if fermenting; pinholey.
9.	Smell very strong; slightly pinholey.
10.	Smell strong; slightly pinholey.
11.	Smell slightly strong; slightly pinholey.
12.	Fair smell; slightly pinholey.
13.	Smell strong; pinholey.
14.	Smell very strong; very pinholey.
15.	Smell strong; very pinholey; spongy, lacking in cohesiveness; very bad curd.
16.	Smell strong; showing some large holes; a fair curd.
17.	Smell off; slightly pinholey; fair curd.
18.	Smell strong; very spongy.
19.	Smell strong; spongy; a weakly cohesive curd.
20.	Smell slightly strong; slightly pinholey; fair curd.
21.	Smell strong; pinholey.
22.	Smell slightly strong; pinholey.
23.	Smell "rather off"; pinholey and slimy.
24.	Smell strong; very pinholey.
25.	Smell fair; slightly pinholey.

SAMPLES OF MILK FROM EACH SUPPLIER TO A CHEESE FACTORY TURNED INTO CURD AND TESTED BY THE WISCONSIN TEST—*continued.*

No.	Remarks.
26.	Smell strong; pinholey.
27.	Smell very strong; pinholey.
28.	Smell very bad; spongy; a disgraceful curd.
29.	Smell strong; slightly pinholey; the curd of short texture.
30.	Smell strong; slightly pinholey.
31.	Smell strong; spongy.
32.	Smell strong; slimy; large holes; looks like beestings.
33.	Smell strong; pinholey.
34.	Smell strong; spongy.
35.	Smell very strong; pinholey.
36.	Smell strong; pinholey.
37.	Smell very strong; very pinholey; peculiar gelatinous appearance.
38.	Smell fair; slightly holey; fair curd.
39.	Smell strong; spongy.
40.	Smell rather strong.
41.	Smell fair; pinholey.
42.	Smell strong; slimy, rather spongy; a weakly cohesive curd.
43.	Smell rather strong; very pinholey.
44.	Smell strong; pinholey; slimy.
45.	Smell fair; slightly pinholey; otherwise fair.
46.	Smell very strong; pinholey; badly tainted milk.
47.	Smell slightly strong; slightly pinholey; fair.
48.	Smell rather strong; spongy.
49.	Smell fair; a fairly solid curd.
50.	Smell strong; slightly pinholey.
51.	Smell very strong; very pinholey.

GARDEN NOTES.

J. Cronin, Inspector Vegetation Diseases Acts.

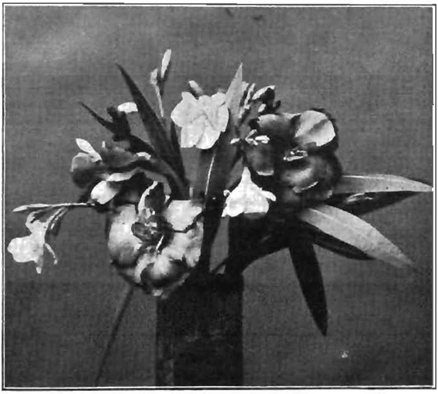
The Oleander.

Nerium—the oleander, is a genus of dwarf shrubs containing three species with several varieties, and is found native in the south-east of Europe and the East Indies. It has been cultivated in England in greenhouses for more than three centuries, and in the south of Europe, where it has become naturalized in many places, for a longer period. It is described in English horticultural works as a plant of great beauty when in flower but virulently poisonous in all its parts. Several hybrid varieties have been raised by Continental nurserymen, a marked improvement having been effected in regard to floriferousness, variation of colour, and in some instances size of the blooms.

The oleander is one of the best hardy shrubs in cultivation in this State, thriving under severe conditions and producing flowers freely during the hottest season of the year. The flowers are not greatly affected by hot sunshine and accordingly the plants are bright and effective for some time. Some of the best of the florists' varieties have been imported, the value of which when known will induce a much more extensive cultivation of this truly hardy flowering shrub. For small cottage and villa gardens the oleander is especially suitable. The height of the plants varies in the different species and varieties—from five to twelve feet normally, a size that can be easily curtailed if necessary. A variegated form of *Nerium splendens* is probably the most handsome dwarf shrub, bearing bright blooms in addition to a beautifully variegated foliage. This variety is not as hardy as the green leaved kinds and requires a more sheltered position.

The soil most suitable to the oleander is a light well drained loam, but it is not fastidious; if the soil is sweet any fair garden soil will suffice to produce and maintain the plants in a vigorous condition. In preparing a site in the bed or border the soil should be worked to a depth of about

two feet and some well decayed manure incorporated. As a specimen plant for small lawns the oleander has few superiors. Though the plants are hardy and will endure a deal of drought, they should not be planted close to large trees, for though they would probably exist for years, and in exceptionally favorable seasons produce a fair amount of bloom in such situations, they are not as satisfactory as when planted where they receive full light and sunshine. Under shade conditions they are very liable to be attacked by scale insects, several species of which are particularly partial to them. They are easily cleaned by the use of kerosene emulsion or resin compound applied as a spray when the growths are matured.



OLEANDER BLOOMS.

Plants may be set out from pots during spring or autumn. At these seasons very little attention is necessary in shading or watering plants that may be somewhat tender owing to their being grown in shade houses in the nursery. A thorough watering at planting time and an occasional stirring of the soil in warm weather is generally sufficient to establish them. Larger plants may be safely lifted from the open ground and transplanted at the same seasons. A fair ball of earth in accordance with the size of the plant should be retained, and the roots be as far as possible uninjured. A thorough soaking, and staking if necessary, will insure safe removal. Established plants require no special care, except in very dry and exposed situations when they benefit by a mulch of manure or weeds applied early in spring. Very little pruning is required; an occasional thinning of the shoots, if becoming crowded, and stopping of extra vigorous shoots or branches that tend to destroy the symmetry of the plants, are all that is necessary.

Oleanders are propagated from cuttings inserted in pots of sandy soil in autumn. The pots should be placed in a close frame until the cuttings are rooted. They are also propagated from cuttings placed in bottles or

other vessels containing water; in this case the cuttings are tied in bunches and suspended in the water. This is usually done by nurserymen who have hot or cold houses for purposes of propagation. The cuttings should be about six inches in length, taken from shoots of the current season's growth and cleanly cut immediately below a joint from which the leaves have been removed. They root readily if layered in early summer, and are usually fit to remove and transplant in the following spring. Layers require watering in dry weather. *Splendens* is the largest grower and most suitable as a specimen plant. The variegated form of this kind is a beautiful specimen or border plant worthy of cultivation in any garden. Other varieties of merit are:—Album plenum, luteum plenum, grandiflorum plenum, Delphine, Madame Peyre, Madonna grandiflorum, Monsieur Belaguier, Mdlle Dubois, Madame Martin, Souvenir de Cazallis Allut, Dr. Goldfire.

Flower Garden.

February is one of the busiest months of the year in gardens where florists' flowers are cultivated for exhibition or for a special display during the autumn months. In order to produce maximum results, the dahlia, rose, and chrysanthemum—the show flowers of the autumn—require careful attention, in addition to the usual cleaning, watering, planting and sowing. Shrubs that have finished their blooming should also be pruned. The chief work in that direction is the removal of growths that have bloomed. Indiscriminate clipping of growths of all ages and stages is the principal reason that various shrubs fail to flower satisfactorily. The shoots require to be thinned and regulated in order that the wood may be ripened by exposure, when flowers of good character may be expected.

At this period dahlia plants produce the growths that carry the bloom next month and should be watered sufficiently to keep them growing freely. Tying the growths to stakes as they develop and thinning out weakly growths are necessary for the production of good flowers. Fully half the lateral shoots that occur should be removed in any case, and where exhibition blooms are desired the buds on the shoots allowed to remain should also be reduced. During hot weather dahlias require more water than any other florists' flower, as the evaporation of moisture is greater on account of their large leaf surface. A good soaking weekly or fortnightly, according to the season and nature of the soil, is sufficient. In light soils deficient in humus the more frequent watering is necessary. A light dressing of guano, blood manure or other rapid acting fertilizer is beneficial when the flower buds are developing.

The crown buds are produced on chrysanthemums during February. The fine exhibition blooms seen at the shows are developed from these buds. Naturally, the crown buds would fail to flower at all as the growth buds that surround them would deprive them of nourishment, but the gardener removes the growth buds early and concentrates the entire energy of the plant to the nutrition of the few flower buds remaining. In the majority of varieties grown any flower buds that occur in the points of the growing shoots after the middle of February usually produce excellent blooms. The flower bud occupies the centre, and is rounded, the surrounding buds, more pointed in form, being vegetative buds. The latter should be removed as soon as the operation can be performed without damaging the flower bud. When the buds are as large as peas weak liquid manure may be applied, or a very light dressing of a complete fertilizer

may be lightly worked into the soil between the plants and "watered" in. Where the beds have been mulched with stable manure the plants require little feeding. Nothing in the way of forcing manures should be given or applied if the growths are extra vigorous and the foliage large and succulent.

Roses should be lightly pruned, any thin weakly growths being entirely removed, and those remaining shortened to a good healthy bud. A soaking with water, followed by an occasional application of weak liquid manure will cause the development of growths that will produce fine flowers during autumn. It usually takes from six to eight weeks to bring the plants into full bloom after the summer rest and pruning.

Delphiniums will produce another crop of flowers if the old flower spikes are cut away and the plants liberally watered. These plants well repay any special attention in this direction.

Seeds of hardy annual and perennial plants may be sown now. The young plants as they appear will require shelter from very hot sun and wind.

Ground should be prepared for the reception of daffodils and other spring flowering bulbs—early in March is the most suitable season for planting many kinds. Manure should not be added to the staple unless the soil is very poor, when well rotted cow manure is most suitable and should be worked deeply in.

Kitchen Garden.

To keep plants growing freely and in a healthy condition at this season liberal applications of water and frequent cultivation of the surface soil are necessary. A mulch of half-rotted stable manure is of the greatest service during dry and hot weather. The roots are kept moist and cool by its agency, and plant food is carried to the feeding roots by every shower or watering.

Celery must be blanched by earthing or some other means that will exclude the light from and destroy the green colouring in the leaf stalks; the effect is to render the stalks crisp and free from stringiness. A plan adopted by many celery growers in America is to blanch by using pine boards for the purpose. These boards are about one inch in thickness and from twelve to fourteen inches in width and are placed one on each side of the rows of plants. They are put in position when the plants are nearly fully grown and are kept upright by means of stakes driven into the ground close to the plants or by nailing short pieces of laths across the top at intervals of about four feet. Some soil is banked against the lower edges to prevent access of light owing to an uneven surface. In two or three weeks the celery is blanched and fit for use, and it is contended for the system that it is cleaner and more readily applied than the usual earth banking. One set of boards could be used several times in a season in a garden where celery was grown extensively and in succession.

Seeds of saladings, carrot, turnip, cabbage, &c., may be sown, and plantings made from former sowings in favorable weather.

After any crop has been harvested the ground should be worked and manured in preparation for a succeeding crop.

SPRAYING FOR THE PUMPKIN BEETLE.

The following report dealing with spraying for the Pumpkin Beetle has been received by the Entomologist from Inspector Wallis of Wangaratta.

"I have the honour to report the results of my experiments with several mixtures on the Pumpkin Beetle which is now doing much damage to pumpkins and other plants.

The mixtures used were as follow:—Paris Green, Arsenite of Lead, "Carbysol" and crude oil of tar emulsion. I cannot say that the arsenical mixtures have been effective although repeated trials have been made. This is rather perplexing as the eperdermis of a leaf is soon destroyed when attacked by a number of the beetles. However I find that if the beetles are confined in an observation jar and a piece of leaf sprayed with the Arsenite of Lead mixture is put in with them, they soon eat the leaf and die. "Carbysol" is not effective either as a contact remedy or in making the food obnoxious. I am glad, however, to report that the oil of tar emulsion has given very good results both as a contact remedy and a deterrent in making food obnoxious to the beetle.

The habits of the beetle are such as to make it easy to destroy it by contact. The beetles congregate in large numbers on a single leaf whilst the other leaves of the plant may remain untouched and only a few of the beetles attempt to take flight when plant is sprayed. I have seen as many as 170 beetles on a pumpkin leaf the other leaves of plant being untouched.

I have found that from 80 per cent. to 90 per cent. of the beetles are killed on the spot when a strength of 1—80 of the tar emulsion is used and the healthy leaves of plant are in no way injured. The beetles had not attempted to attack the plant during the week following the day of spraying. I tried this same emulsion with a lesser strength (1—160 and 1—120) also a greater strength (1—50). The former strengths proved too weak simply stupifying the beetles for a few minutes. The 1—50 strength if allowed to remain in any quantity on leaves, caused foliage to burn.

The following is the formula which I have used successfully:—Crude oil of tar, ½ pint; Soft soap, ½ lb.; Caustic soda, 1 oz.; water, 5 gallons. Make as follows:—Boil one pint water and in it dissolve soap and soda; add oil of tar, and agitate well. Then add the mixture to remainder of water (hot), agitate and use. Confine attention chiefly to leaves on which beetles have swarmed and use a good garden syringe to spray mixture on plant. The price of crude oil of tar is about 5s. per gallon at wholesale places.

At Messrs. Swan Bros. orchard, Londrigans, I found the beetle attacking cherries, the crop of one tree being almost destroyed, whilst the cherries on the other trees were more or less infested. I saw as many as six beetles attacking one cherry. When the beetle has done its destructive work the cherry somewhat resembles a raisin in appearance. When attacking a cherry, the beetle does not eat away the surface but eats a hole into the fruit and then appears to eat or suck away the flesh leaving the skin to become wrinkled and dry.

I have not found the beetle attacking fruit at any other orchard."

THE ARTIFICIAL MANURES ACTS.

Unit Values for the Year 1908.

W. Percy Wilkinson, Government Analyst for Victoria, and Acting Chemist for Agriculture.

The requirements of the Victorian Artificial Manures Acts are as follow in regard to the analysis of samples of manures each year:—

"In the case of manures which are not liable to vary in quality during the current season every vendor of or dealer in manures, who is required by the Minister to do so and manufacturer or importer of manures shall every year in the month of October or November and also whenever required by the Minister so to do deliver to the said chemist without payment samples not exceeding two pounds in weight of the manures which he intends to offer for sale or which he will use in making any special mixture required and which are not liable to vary in quality during the current season."

"The said vendor manufacturer importer or dealer shall forward with such samples a statutory declaration in such form as may be prescribed to the effect that the samples delivered are correct samples of all the manures to which this section applies which he will offer for sale or sell during the current season and declaring the prices at which he will either himself or through his agents sell such manures to persons who require the same for purposes of cultivation but he may vary any such price after giving notice of such variation to the said chemist."

"The said chemist shall analyze or cause to be analyzed under his supervision all samples forwarded to him pursuant to this Act by vendors manufacturers or importers of or dealers in manures, and taking into account the constituents which have a commercial value in each sample, shall calculate from the results of the analysis the average unit value of such constituents, and shall then compile a complete list of all the manures offered for sale showing the prices asked for the same and showing also their value according to the average unit values as calculated from the analyses."

"Such average unit values shall constitute the basis for calculating the values of all manures for twelve months from the publication of such list pursuant to the provisions of the Artificial Manures Acts."

The samples of manures forwarded to the Chemist for Agriculture for analysis and valuation for the 1908 season numbered 109. The analyses of the whole of these samples of manures, their selling prices, and their calculated values are shown in the tabulated list on pages 105—109.

UNIT VALUES OF MANURES IN THE MELBOURNE MARKET FOR THE 1908 SEASON.

	Unit Value. s.	d.
1 per cent. of nitrogen in the form of nitrate of soda ...	17	0
,, ,, nitrate of potash ...	17	0
,, ,, sulphate of ammonia	14	0
,, ,, blood manure ...	12	0
,, ,, fine bonedust ...	12	0
,, ,, coarse bonedust ...	9	6

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If an invoice does not state whether the nitrogen in the manure is in the form of nitrate, or sulphate, or blood, or bones, it is to be assumed to have the value of bone nitrogen.

	Unit Value. s.	d.
1 per cent. of water soluble phosphoric acid	4	9
1 per cent. of citrate soluble phosphoric acid in Thomas phosphates, nitro-superphosphates, ordinary superphosphates, guanos and fine bone	4	0
1 per cent. of insoluble phosphoric acid in Thomas phosphates, superphosphate, guanos, and coarse bone	3	6
1 per cent. of insoluble phosphoric acid in ordinary superphosphates and nitro-superphosphates	1	0
1 per cent. of potash	5	6

METHOD OF CALCULATING THE COMMERCIAL VALUE OF A MANURE.

The average commercial value per ton of a manure sold in Victoria is obtained by multiplying the percentages stated of the fertilizing substances by the corresponding unit values fixed therefor, and adding the separate values together. Examples:—

1. Sulphate of ammonia. Invoice certificate. 18 per cent. nitrogen—
   Calculation: 18 x 14s. £12 12 0
   Calculated value per ton 12 12 0

2. Superphosphate—
   Invoice certificate 20 per cent. phosphoric acid (water soluble).
   ,, ,, 2½ ,, ,, ,, (citrate soluble).
   ,, ,, 1½ ,, ,, ,, (insoluble).

Calculation—

	£	s.	d.
Phosphoric acid (water soluble), 20 x 4s. 9d.	£4	15	0
,, ,, (citrate soluble), 2½ x 4s. ...	0	10	0
,, ,, (insoluble), 1½ x 1s.	0	1	6
Calculated value per ton	£5	6	6

3. Bonedust—
   Invoice certificate, 5 per cent. nitrogen, 20 per cent. phosphoric acid.
   Mechanical condition: 30 per cent. fine, 70 per cent. coarse.

Calculation—

Nitrogen—Fine $\frac{5 \times 30}{100} = 1{\cdot}5 \times 12s. =$ £0 18 0

Coarse $\frac{5 \times 70}{100} = 3.5 \times 9s.\ 6d. =$ 1 13 3

Phosphoric acid—Fine $\frac{20 \times 30}{100} = 6 \times 4s. =$ 1 4 0

Coarse $\frac{20 \times 70}{100} = 14 \times 3s.\ 6d. =$ 2 9 0

Calculated value per ton £6 4 3

PRACTICAL UTILITY OF THE UNIT VALUE SYSTEM.

The practical utility of the unit value system is that it enables a farmer to readily ascertain if the price asked for a manure is its reasonable commercial value. The term used the "commercial value" must not be confused with the "agricultural value" of a manure. They are quite distinct. The commercial value represents the value of a manure *according to its composition.* The *agricultural value of a manure is* measured by the extent of the increase in quantity and quality produced by it in a particular crop grown in a particular soil, under certain conditions. The agricultural value of a manure may vary quite extensively. A particular soil, for instance, may not give an increased crop return after application of nitrogenous manures commensurate with the cost of the fertilizer. On another soil an application of superphosphate may not increase the yield. In both instances the manures would have no positive agricultural value.

The "commercial value" of a manure is determined by the percentage of certain constituents in it possessing fertilizing properties and their unit value. The assumption is made that the manures are all prepared from materials of the same quality and value, but this is not strictly in accord with practice as each manufacturer has his own source of supply of materials. In the table of unit values it will be seen that the value for citrate soluble phosphoric acid is quoted as 9d. less per unit than the water soluble. The general result of Victorian experiments shows that water soluble phosphoric acid has a higher agricultural value in wheat growing than citrate soluble phosphoric acid, and it is generally assumed that its solubility enables it to come more easily within range of plant roots. In any case, after application to the soil, the water soluble phosphoric acid becomes "reverted." The rate at which this change proceeds depends on the composition of the soil to which the fertilizer is applied, the reversion being most rapid in soils containing carbonate of lime.

REQUIREMENTS OF ARTIFICIAL MANURES ACTS.

A special feature of the Victorian Artificial Manures Acts is the requirement of a label or tag attached to the bags declaring the guaranteed composition by analysis of any manure sold in the State in quantities exceeding 56 lbs. at one sale. This is provided by section 7 of the principal Act, and, as a further measure of protection to farmers, it is made compulsory, under section 5, for vendors to deliver to all purchasers of manures an invoice certificate declaring the guaranteed analysis of the manure sold. No farmer in Victoria should take delivery of manure unless the above conditions of sale are complied with. Substantial assistance would be rendered in the enforcement of the Act if farmers *would immediately report any irregularity observed in the sale of manures* to the Chemist for Agriculture. Additional control of the sale of manures has been provided by the amended Act, 10th October, 1905. Under section 4, sub-section (1), officers of the Chemist's branch may collect samples of manures at railway stations and farms throughout the State. The results of the analysis as to the percentage of fertilizing constituents found in a manure, and the percentage claimed by the guarantee on tag and invoice certificate are published side by side along with the calculated value. These analyses are published in the *Government Gazette* and in

the *Journal of the Department of Agriculture* from time to time, and should be read by all users of manures. During the past season (February, 1907, to January, 1908) 174 samples of fertilizers were collected and the analyses published. It is quite noteworthy that almost without exception the whole of the samples in this large collection of manures were well up to guarantee, and in many instances were in excess of the percentages of fertilizing constituents guaranteed. This may be regarded as a proof of the honest endeavour of manure vendors in this State to comply, in a straightforward manner, with the requirements of the Artificial Manures Acts.

UNIT VALUES FOR YEARS 1905-8.

The following particulars respecting the Unit Values for the years 1905-8 are published for comparative purposes :—

UNIT VALUES.

	Season 1905.		Season 1906.		Season 1907.		Season 1908.	
	s.	d.	s.	d.	s.	d.	s.	d.
1 per cent. of nitrogen in the form of nitrate of soda	15	6	15	6	15	6	17	0
1 per cent. of nitrogen in the form of nitrate of potash	15	0	15	6	15	6	17	0
1 per cent. of nitrogen in the form of sulphate ammonia	14	4	14	4	14	4	14	0
1 per cent. of nitrogen in the form of blood manure	11	0	11	0	11	0	12	0
1 per cent. of nitrogen in the form of fine bonedust	11	0	11	0	11	0	12	0
1 per cent. of nitrogen in the form of coarse bonedust	9	0	9	0	9	6	9	6
1 per cent of water soluble phosphoric acid ...	5	3	4	6	4	6	4	9
1 per cent. of citrate soluble phosphoric acid in Thomas phosphates, nitro-superphosphates, ordinary superphosphates, guanos, and fine bone	4	8	4	0	4	0	4	0
1 per cent. of insoluble phosphoric acid in *Thomas phosphates, nitro-superphosphates,** guanos, and coarse bone	3	0	3	0	3	0	3	6
1 per cent. of insoluble phosphoric acid in ordinary superphosphates	1	0	1	0	1	0	1	0
1 per cent. of potash	5	0	5	6	5	6	5	6

PRODUCTION OF INVOICE CERTIFICATES

It is necessary, in order to carry out the Act, for the chemist to occasionally require purchasers of manures to forward copies of the invoice certificates supplied to them for his inspection. It has frequently been found that purchasers do not retain the invoice certificates in their possession. Every purchaser of manure is required by section 24 of the Act to keep any invoice certificate supplied by the vendor of manure, for failure to produce the invoice certificate when required to do so by the Chemist for Agriculture renders purchasers of manures liable to a penalty not exceeding £1 for the first offence, and not exceeding £5 for any subsequent offence.

* For 1908 Season 1 per cent. of Insoluble Phosphoric Acid in a Nitro-superphosphate is worth 1s.

LIST OF UNIT VALUES OF MANURES IN THE MELBOURNE MARKET DURING THE 1908 SEASON.

Description of Manure.	Moisture. Percentage.	Nitrogen. Percentage.	Nitrogen. Estimated Value in One ton of the *Manure*.	Phosphoric Acid. Percentage.	Phosphoric Acid. Estimated Value in One ton of the *Manure*.	Potash. Percentage.	Potash. Estimated Value in One ton of the *Manure*.	Estimated Total Value of Manure per ton.	Price asked for Manure per ton Delivered at Local Railway *Station*.	Where Obtainable.
Mainly Nitrogenous.			£ *s.* *d.*		£ *s.* *d.*			£ *s.* *d.*	£ *s.* *d.*	
Sulphate of Ammonia	..	21.01	14 14 2	..	..	..	..	14 14 2	14 2 6	Metropolitan Gas Coy., Melbourne
Nitrate of Soda	..	15.90	13 10 4	..	..	..	..	13 10 4	13 10 0	Wischer and Co. Prop. Ld., Melbourne
,, ,, ...	..	15.74	13 7 7	..	..	..	..	13 7 7	13 10 0	Cuming, Smith, and Co. Prop. Ld., Melbourne
,, ,, ...	..	15.63	13 5 9	..	..	..	..	13 5 9	13 10 0	Mt. Lyell M. and R. Coy., Ld., Melbourne
,, ,, ...	..	15.63	13 5 9	..	..	..	..	13 5 9	13 10 0	Aust. Explosives and Chemical Coy. Ld., Melbourne
Blood Manure	33.64	9.45	5 13 5	1.54	0 5 5	..	..	5 18 10	7 10 0	W. Angliss and Co., Footscray
,, ,, ...	31.40	9.65	5 15 10	1.96	0 6 10	..	..	6 2 8	7 0 0	Thos. Borthwick and Sons, Footscray
,, ,, ...	22.59	8.51	5 2 2	2.01	0 7 0	..	..	5 9 2	6 5 0	N. Dale, East Brighton
,, ,, (Deniliquin) ..	16.30	12.66	7 11 10	1.41	0 4 11	..	..	7 16 9	6 10 0	J. Cooke and Co., Melbourne
,, ,, (Newport) ..	11.20	12.26	7 7 1	2.12	0 7 5	..	..	7 14 6	6 10 0	J. Cooke and Co., Melbourne
Mainly Potassic.										
Kainit	..	..	..	..	..	12.63	3 9 6	3 9 6	4 17 6	Cuming, Smith, and Co. Prop. Ld., Melbourne
,, ...	..	..	..	..	..	12.55	3 9 0	3 9 0	4 17 6	Mt. Lyell M. and R. Coy. Ld., Melbourne
,, ...	..	..	..	..	..	12.68	3 9 9	3 9 9	4 17 6	Wischer and Co. Prop. Ld., Melbourne
,, ...	..	..	..	..	..	12.70	3 9 10	3 9 10	4 17 6	Renard Fertilizer Coy. Prop. Ld., Melbourne
Potash Chloride (Muriate) ..	..	..	..	..	..	61.00	16 15 6	16 15 6	13 12 6	Wischer and Co. Prop. Ld., Melbourne
,, ,, ,, ..	..	..	..	..	..	60.78	16 14 4	16 14 4	13 12 6	Aust. Explosives and Chemical Coy. Ld., Melbourne
,, ,, ,, ..	..	..	..	..	..	60.78	16 14 4	16 14 4	13 12 6	Mt. Lyell M. and R. Coy. Ld., Melbourne
,, ,, ...	..	..	..	..	..	60.81	16 14 6	16 14 6	13 12 6	Renard Fertilizer Coy. Prop. Ld., Melbourne
,, ,, ...	..	..	..	..	..	60.85	16 14 8	16 14 8	13 12 6	Cuming, Smith, and Co. Prop. Ld., Melbourne
Potash Nitrate	..	13.63	11 11 8	..	..	46.25	12 14 4	24 6 0	20 0 0	Cuming, Smith, and Co. Prop. Ld., Melbourne
,, ,, ...	..	13.70	11 12 11	..	..	46.30	12 14 8	24 7 7	20 0 0	Mt. Lyell M. and R. Coy. Ld., Melbourne
Potash Sulphate	..	..	..	..	..	52.05	14 6 3	14 6 3	13 17 6	Wischer and Coy. Prop. Ld., Melbourne
,, ,, ...	..	..	..	..	..	52.07	14 6 4	14 6 4	13 17 6	Aust. Explosives and Chemical Coy. Ld., Melbourne
,, ,, ...	..	..	..	..	..	52.05	14 6 3	14 6 3	13 17 6	Cuming Smith, and Co. Prop. Ld., Melbourne
,, ,, ...	..	..	..	..	..	52.08	14 6 5	14 6 5	13 17 6	Renard Fertilizer Coy. Prop. Ld., Melbourne
,, ,, ...	..	..	..	..	..	51.96	14 5 9	14 5 9	13 17 6	Mt. Lyell M. and R. Coy. Ld., Melbourne

LIST OF UNIT VALUES OF MANURES IN THE MELBOURNE MARKET DURING THE 1908 SEASON—*continued.*

Description of Manure.	Moisture. Percentage.	Nitrogen. Percentage.	Nitrogen. Estimated value in One ton of the Manure.	Phosphoric Acid. Water Soluble. Percentage.	Phosphoric Acid. Water Soluble. Estimated Value in One ton of the Manure.	Phosphoric Acid. Citrate Soluble. Percentage.	Phosphoric Acid. Citrate Soluble. Estimated Value in One ton of the Manure.	Phosphoric Acid. Insoluble. Percentage.	Phosphoric Acid. Insoluble. Estimated Value in One ton of the Manure.	Phosphoric Acid. Total. Percentage.	Phosphoric Acid. Total. Estimated Value in One ton of the Manure.	Estimated Total Value of Manure per ton.	Price asked for Manure per ton. Delivered at Local Railway Station.	Where Obtainable.
Mainly Phosphoric, Phosphoric Acid readily soluble.			£ s. d.		£ s. d.		£ s. d.		£ s. d.		£ s. d.	£ s. d.	£ s. d.	
Superphosphate ..	8.66	..	..	17.52	4 3 3	2.50	0 10 0	..	..	20.02	4 13 3	4 13 3	4 7 6	P. Rohs, Bendigo
Superphosphate, Hasell's	10.01	..	..	17.98	4 5 5	1.25	0 5 0	..	..	19.23	4 10 5	4 10 5	4 5 0	A. H. Hasell, Queen-street, Melbourne
Superphosphate, Hasell's A 1	9.87	..	..	19.40	4 12 2	1.32	0 5 3	..	..	20.72	4 17 5	4 17 5	4 10 0	,, ,, ,, ,,
Superphosphate, No. 1, Anchor Brand	6.29	..	..	16.79	3 19 9	1.33	0 5 4	1.82	0 1 10	19.94	4 6 11	4 6 11	4 7 6	Colonial Manures Coy., Melbourne
Superphosphate, No. 2, Anchor Brand	3.70	..	..	13.35	3 3 5	2.06	0 8 3	1.44	0 1 5	16.85	3 13 1	3 13 1	3 15 0	,, ,, ,, ,,
Superphosphate, Ordinary	6.08	..	..	17.33	4 2 4	1.36	0 5 5	1.91	0 1 11	20.60	4 9 8	4 9 8	4 7 6	Aust. Explosives and Chemical Coy. Ld., Melbourne
Superphosphate, 15 per cent.	4.80	..	..	13.60	3 4 7	1.11	0 4 5	1.29	0 1 3	16.00	3 10 3	3 10 3	3 15 0	,, ,, ,, ,,
Superphosphate, Florida	6.12	..	..	17.20	4 1 8	1.54	0 6 2	1.92	0 1 11	20.66	4 9 9	4 9 9	4 7 6	Cuming, Smith, and Co. Prop. Ld., Melbourne
Superphosphate, Concentrated	12.39	..	..	40.67	9 13 2	4.32	0 17 3	0.39	0 0 4	45.38	10 10 9	10 10 9	12 10 0	,, ,, ,, ,,
Superphosphate, No. 2, Sickle Brand	5.06		..	13.40	3 3 8	1.47	0 5 11	1.28	0 1 3	16.15	3 10 10	3 10 10	3 15 0	,, ,, ,, ,,
Superphosphate, No. 1 ..	6.17	..	..	16.70	3 19 4	1.93	0 7 9	1.87	0 1 10	20.50	4 8 11	4 8 11	4 7 6	Wischer and Co. Prop. Ld., Melbourne
Superphosphate, No. 2 ..	4.58	..	..	12.58	2 19 9	1.30	0 5 2	1.28	0 1 4	15.16	3 6 3	3 6 3	3 15 0	,, ,, ,, ,,
Superphosphate, Concentrated	12.30	..	..	40.67	9 13 2	4.68	0 18 9	0.29	0 0 3	45.64	10 12 2	10 12 2	12 10 0	,, ,, ,, ,,
Superphosphate, No. 1, Standard Flag Brand	6.25		..	16.35	3 17 8	2.03	0 4 2	2.12	0 2 2	20.50	4 4 0	4 8 0	4 7 6	Renard Fertiliser Coy. Prop. Ld., Melbourne
Superphosphate, Concentrated Standard Flag Brand	12.03	..	..	40.73	9 13 6	4.32	0 17 3	0.39	0 0 4	45.44	10 11 1	10 11 1	12 10 0	,, ,, ,, ,,

Superphosphate, Standard B, Flag Brand	5.40	..	..	14.56	3 9 2	1.61	0 6 5	1.32	0 1 4	17.49	3 16 11	3 16 11	3 15 0	Renard Fertilizer Coy. Prop. Ld., Melbourne
Superphosphate, No. 1..	5.90	..	.	17.08	4 1 1	1.36	0 5 5	1.85	0 1 10	20.29	4 8 4	4 8 4	4 7 6	Mt. Lyell M. and R. Coy. Ld., Melbourne
Superphosphate, No. 2..	5.85	..	..	13.38	3 3 6	1.82	0 7 3	1.18	0 1 2	16.38	3 11 11	3 11 11	3 15 0	,, ,, ,, ,,
Superphosphate, Concentrated	12.05	..	..	40.75	9 13 6	4.41	0 17 8	0.36	0 0 4	45.52	10 11 6	10 11 6	12 10 0	,, ,, ,, ,,
Containing Nitrogen also.														
Dissolved Bones ..	8.93	1.25	0 13 10	10.05	2 7 9	5.77	1 8 1	7.48	1 6 2	23.30	4 17 0	5 10 10	5 0 0	Cuming, Smith, and Co. Prop. Ld., Melbourne
Bonedust and Superphosphate	8.10	2.02	1 1 8	5.23	1 4 10	10.44	2 1 9	2.28	0 8 0	17.95	3 14 7	4 16 3	5 5 0	J. A. Dundas, Footscray
Phosphoric Acid moderately soluble.														
Thomas Phosphate ..	..	..	..	..	..	16.90	3 7 7	1.02	0 3 7	17.92	3 11 2	3 11 2	4 5 0	Aust. Explosives and Chemical Coy., Melbourne
,, ,, ..	..	..	..	..	..	16.84	3 7 4	1.11	0 3 10	17.95	3 11 2	3 11 2	4 5 0	Cuming, Smith, and Co. Prop. Ld., Melbourne
,, ,, ..	..	..	..	..	..	13.80	2 15 2	1.43	0 5 0	15.23	3 0 2	3 0 2	4 0 0	Welch, Perrin, and Co., Melbourne
,, ,, ..	..	..	..	..	..	17.11	3 8 5	0.79	0 2 9	17.90	3 11 2	3 11 2	4 5 0	Wischer and Co. Prop. Ld., Melbourne
Thomas Phosphate, Standard Flag Brand	..	..	..	..	..	16.86	3 7 5	1.06	0 3 8	17.92	3 11 1	3 11 1	4 5 0	Renard Fertilizer Coy. Prop. Ld., Melbourne
Thomas Phosphate ..	..	..	..	..	..	16.90	3 7 7	1.02	0 3 7	17.92	3 11 2	3 11 2	4 5 0	Mt. Lyell M. and R. Coy. Ld., Melbourne
Thomas "Star" Phosphate	..	..	..	..		16.80	3 7 2	1.27	0 4 5	18.07	3 11 7	3 11 7	4 5 0	Colonial Manures Coy., Melbourne
Thomas "Star" Phosphate and Superphosphate	1.16	..		6.65	1 11 7	9.70	1 18 10	0.75	0 2 7	17.10	3 13 0	3 13 0	4 15 0	,, ,, ,, ,,
Phosphoric Acid difficultly soluble.														
Marion Guano, Hasell's 60 per cent.	0.49	..	..	..	..	1.53	0 6 2	29.24	5 2 4	30.77	5 8 6	5 8 6	4 0 0	A. H. Hasell, Melbourne
Phosphate Guano	..	..	..	..	..	..	..	..	..	18.48	3 4 8	3 4 8	2 10 0	Wm. Holden, St. Leonards
Guano, 50 per cent. ..	0.72	..	..	..	..	..	..	..	..	24.52	4 5 10	4 5 10	3 10 0	Cuming, Smith, and Co. Prop. Ld., Melbourne
,, 80 per cent. ..	2.37	..	..	..	..	..	..	..	..	36.30	6 7 1	6 7 1	5 0 0	,, ,, ,, ,,
,, 50 per cent. ..	0.73	..	..	..	..	..	..	..	..	24.52	4 5 10	4 5 10	3 10 0	Wischer and Co. Prop. Ld., Melbourne
,, 80 per cent. ..	2.35	..	..	..	..	..	..	..	..	36.47	6 7 8	6 7 8	5 0 0	,, ,, ,, ,,
,, 50 per cent. ..	0.74	..	..	..	..	..	..	..	..	24.37	4 5 4	4 5 4	3 10 0	Mt. Lyell M. and R. Coy. Ld., Melbourne
,, 80 per cent. ..	2.33	..	..	..	..	..	..	..	..	36.37	6 7 4	6 7 4	5 0 0	,, ,, ,, ,,

LIST OF UNIT VALUES OF MANURES IN THE MELBOURNE MARKET DURING THE 1908 SEASON—*continued.*

Description of Manure.	Moisture.	Nitrogen.		Phosphoric Acid.		Mechanical Condition.						Estimated Total Value of Manure per ton.	Price asked for Manure per ton. Delivered at the Local Railway Station.	Where Obtainable.
								Nitrogen.		Phosphoric Acid.				
	Per-cent-age.	Per-cent-age.	Estimated Value in One ton of the Manure.	Per-cent-age.	Estimated Value in One ton of the Manure.	Per-cent-age of Fine Bone.	Per-cent-age of Coarse Bone.	Per-cent-age in *Fine Bone.*	Per-cent-age in *Coarse Bone.*	Per-cent-age in Fine *Bone.*	Per-cent-age in Coarse *Bone.*			
Containing Phosphoric Acid and Nitrogen. Phosphoric Acid difficultly soluble.			£ s. d.		£ s. d.							£ s. d.	£ s. d.	
Bonedust	5.65	3.65	1 18 1	20.22	3 14 3	37.60	62.40	1.37	2.28	6.90	13.32	5 12 4	5 10 0	E. T. Hoskin, Bairnsdale
,, "Kensington" ..	7.02	3.71	1 18 6	23.30	4 5 8	35.20	64.80	1.30	2.41	8.20	15.10	6 4 2	5 15 0	J. Kitchen and Sons Ld., Melbourne
,, "Apollo"	5.56	5.05	2 12 7	19.55	3 12 0	36.60	63.40	1.84	3.21	7.15	12.40	6 4 7	6 7 6	,, ,, ,,
,, "Waddell" ..	11.75	3.49	1 15 9	20.27	3 14 0	30.20	69.80	1.05	2.44	6.12	14.15	5 9 9	5 10 0	,, ,, ,,
,, ...	8.28	2.72	1 8 11	10.61	1 19 7	45.75	54.25	1.24	1.48	4.85	5.76	3 8 6	5 10 0	A. W. Redman, Brunswick
,, ...	6.70	4.94	2 10 0	17.03	3 1 8	25.05	74.95	1.23	3.71	4.26	12.77	5 11 8	5 5 0	N. Dale, East Brighton
Bonedust and Blood	11.12	6.10	3 0 8	12.78	2 5 10	17.70	82.30	1.08	5.02	2.26	10.52	5 6 6	5 15 0	,, ,, ,,
Bonedust, A.N.A Surprise ..	6.55	3.15	1 12 1	17.92	3 5 3	27.80	72.20	0.87	2.28	4.98	12.94	4 17 4	5 0 0	Pennell Bros., Braybrook
Bonedust	6.75	4.26	2 3 7	20.45	3 14 7	29.30	70.70	1.24	3.02	5.98	14.47	5 18 2	5 5 0	J. W. Branch, Geelong
,, ...	5.49	4.55	2 4 0	22.15	3 18 3	6.55	93.45	0.29	4.26	1.45	20.70	6 2 3	6 0 0	J. J. Jopling, Mount Rowan
,, ...	9.35	3.19	1 11 4	17.88	3 3 11	13.50	86.50	0.42	2.77	2.73	15.15	4 15 3	5 10 0	J. A. Dundas, Footscray
,, ...	9.68	3.59	1 15 9	22.15	3 19 6	18.50	81.50	0.66	2.93	4.09	18.06	5 15 3	6 0 0	E. Owen, Allansford
,, ...	11.15	2.89	1 9 6	16.38	2 19 8	28.60	71.40	0.82	2.07	4.68	11.70	4 9 2	5 0 0	P. Fitzgerald, East *Brighton*
,, ...	10.00	3.98	2 2 7	20.28	3 15 10	48.00	52.00	1.91	2.07	9.73	10.55	5 18 5	5 15 0	S. and F. Bugg, Kyneton
,, ...	7.24	3.72	1 19 6	21.50	4 0 1	44.50	55.50	1.67	2.05	9.67	11.83	5 19 7	5 10 0	J. R. Elsworth, Ballarat
,, ...	11.42	3.87	1 19 9	21.52	3 18 7	30.00	70.00	1.17	2.70	6.46	15.06	5 18 4	6 0 0	J. R. Sporn, Nhill
,, ...	4.76	2.71	1 10 1	17.09	3 5 5	64.50	35.50	1.76	0.95	11.10	5.99	4 15 6	5 5 0	H. J. Feore and Co., Richmond
,, ...	12.35	3.92	1 18 5	22.67	4 0 9	12.00	88.00	0.47	3.45	2.72	19.95	5 19 2	5 15 0	W. Moore, Panmure
,, ...	6.22	4.60	2 5 4	21.38	3 16 4	14.29	85.80	0.65	3.95	3.03	18.33	6 1 8	5 10 0	A. Day, Bendigo
,, No. 1 Magic ..	6.17	4.92	2 9 8	18.12	3 5 7	23.70	76.30	1.16	3.76	4.29	13.83	5 15 3	5 0 0	G. Gardiner, Geelong
,, No. 2 Magic ..	4.63	3.07	1 10 8	20.85	3 15 0	19.90	80.10	0.61	2.46	4.03	16.82	5 5 8	4 10 0	,, ,,
,, No. 3 Magic Fertilizer	5.79	2.40	1 5 6	12.87	2 8 0	45.20	54.80	1.10	1.30	5.81	7.06	3 13 6	4 0 0	,, ,,
Bonedust and Blood	8.19	5.95	3 1 9	16.16	2 19 4	34.50	65.50	2.08	3.87	5.65	10.51	6 1 1	6 0 0	W. Angliss and Co., *Footscray*
Bonedust	4.70	2.80	1 11 3	18.53	3 10 11	65.50	34.50	1.83	0.97	12.13	6.40	5 2 2	5 10 0	Mt. Lyell M. and R. Coy. Ld., Melbourne
Bonedust, Special Standard Flag Brand	5.13	3.60	1 17 5	22.55	4 2 11	35.40	64.60	1.27	2.33	7.98	14.57	6 0 4	6 0 0	Renard Fertilizer Coy. Prop. Ld., Melbourne
Bonedust	4.67	2.73	1 9 10	18.76	3 11 1	57.50	42.50	1.57	1.16	10.78	7.98	5 0 11	5 10 0	,, ,,
Blood Digester Refuse ..	4.35	6.09	3 2 6	14.75	2 13 11	30.70	69.30	1.87	4.22	4.56	10.19	5 16 5	5 15 0	Thos Borthwick and Sons, *Portland*

Bonedust, Mixed	11.79	4.79	2 8 4	14.85	2 13 10	23.80	76.20	1.14	3.65	3.53	11.32	5 2 2	5 10 0	Thos. Borthwick and Sons, Footscray
Blood and Bone Mixed ..	17.38	5.82	2 18 0	11.80	2 2 5	18.50	81.50	1.07	4.75	2.18	9.62	5 0 5	6 0 0	,, ,, ,,
Bonedust	5.58	2.73	1 10 2	18.59	3 11 0	63.70	36.30	1.74	0.99	11.84	6.75	5 1 2	5 10 0	Wischer and Co. Prop. Ld., Melbourne
,, ...	5.75	3.30	1 13 10	23.08	4 4 8	33.40	66.60	1.00	2.30	7.70	15.38	5 18 6	5 15 0	Exrs. T. Brown, Hamilton
,, Special	5.42	5.40	2 15 6	19.35	3 10 8	30.50	69.50	1.65	3.75	5.90	13.45	6 6 2	6 0 0	Cuming, Smith, and Co. Prop Ld., Melbourne
,, ...	5.23	2.70	1 9 3	18.55	3 9 10	52.50	47.50	1.42	1.28	9.75	8.80	4 19 1	5 10 0	,, ,, ,,
Bonemeal	7.10	3.04	1 11 0	25.60	4 13 1	27.70	72.30	0.84	2.20	7.09	18.51	6 4 1	6 0 0	,, ,, ,,
Bonedust	11.92	4.16	2 3 3	19.60	3 12 2	36.30	63.70	1.50	2.66	7.11	12.49	5 15 5	5 10 0	J. Cockbill, Post Office-place, Melbourne
,, ...	6.09	3.96	2 1 0	22.40	4 2 2	33.70	66.30	1.33	2.63	7.55	14.85	6 3 2	5 10 0	Heinz Bros., Ballarat
,, ...	5.10	2.60	1 8 6	18.90	3 11 8	58.50	41.50	1.52	1.08	11.05	7.85	5 0 2	5 10 0	Aust. Explosives and Chemical Coy., Melb.
.. ..	6.94	3.86	1 18 9	21.66	3 18 0	20.60	79.40	0.81	3.05	4.46	17.20	5 16 9	5 10 0	E. A. Kleiner, Wangaratta
Deniliquin Animal Fertilizer ..	6.47	7.20	3 16 0	14.10	2 12 4	42.00	58.00	3.02	4.18	5.92	8.18	6 8 4	5 10 0	J. Cooke and Co., Melb.
Newport Animal Fertilizer ..	5.44	5.78	2 19 4	13.10	2 7 10	30.50	69.50	1.76	4.02	3.96	9.14	5 7 2	5 10 0	,, ,, ,,
Bonedust	5.81	3.74	1 19 6	24.38	4 10 6	42.80	57.20	1.60	2.14	10.44	13.94	6 10 0	6 10 0	Little and Sons, Ararat
,, ...	8.30	4.05	2 5 1	18.08	3 9 3	65.50	34.50	2.06	1.39	11.85	6.23	5 14 4	5 10 0	J. Adams, Doreen
,, ...	3.65	4.28	2 3 1	23.45	4 4 8	22.70	77.30	0.97	3.31	5.32	18.13	6 7 9	5 10 0	P. Rohs, Bendigo
,, Anchor Brand ..	4.28	2.84	1 11 6	18.68	3 11 2	62.20	37.80	1.81	1.03	11.62	7.06	5 2 8	5 10 0	Colonial Manures Coy., Melbourne
,, ...	6.20	4.20	2 4 9	23.30	4 6 11	46.20	53.80	1.94	2.26	10.76	12.54	6 11 8	6 0 0	C. Sargeant, Warragul

Description of Manure.	Moisture.	Nitrogen.		Phosphoric Acid.								Potash.		Estimated Total Value of Manure per ton.	Price asked for Manure per ton Delivered at Local Railway Station.	Where Obtainable.
				Water Soluble.		Citrate Soluble.		Insoluble.		Total.						
Mixed Manures, containing Nitrogen, Phosphoric Acid, and Potash.	Percentage.	Percentage.	Estimated Value in One ton of the Manure.	Percentage.	Estimated Value in One ton of the Manure.	Percentage.	Estimated Value in One ton of the Manure.	Percentage.	Estimated Value in One ton of the Manure.	Percentage.	Estimated Value in One ton of the Manure.	Percentage.	Estimated Value in One ton of the Manure.			
			£ s. d.		£ s. d.		£ s. d.		£ s. d.		£ s. d.		£ s. d.	£ s. d.	£ s. d.	
Ohlendorff's Dissolved Peruvian Guano	3.52	5.82	3 19 2	7.94	1 17 9	2.74	0 11 0	0.56	0 2 0	11.24	2 10 9	1.77	0 9 9	6 19 8	13 5 0	Gibbs, Bright, and Co., Melbourne

W. PERCY WILKINSON, Acting Chemist for Agriculture.

Government Laboratory, Melbourne, 9th January, 1908.

PREPARING LAND FOR IRRIGATION.

Elwood Mead, Chairman, State Rivers and Water Supply Commission.

The large number of inquiries recently received by the State Rivers and Water Supply Commission about preparing land for irrigating lucerne has rendered it impossible to make adequate reply by letter. This article has been prepared to serve as a substitute. It is based on American practices, being taken, with slight modification to suit Victorian conditions, from the Irrigation Bulletins of the U.S. Office of Experiment Stations. The illustrations are also taken from the same source.

Methods of Irrigating.

Five methods of watering lucerne suited to the soil and conditions of Victoria will be considered. These are:—

1. Flooding by Contour Channels.
2. Flooding by means of Contour Checks.
3. Flooding by means of Rectangular Checks.
4. Flooding by means of Borders.
5. Percolation from small Furrows.

1. Flooding from Contour Channels.—This is the oldest and simplest form of field irrigation and consists in turning the water upon the land from contour channels, or channels having small grades, either by damming the channel and letting the water flow over its bank or by making spade cuts at intervals along the bank.

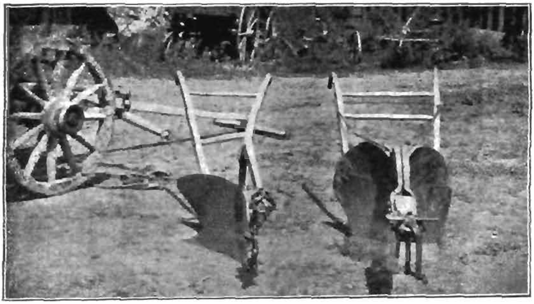


FIG. 1. HOME-MADE PLOUGH FOR MAKING FIELD CHANNELS.

In irrigating lucerne these field channels are run out from head or supply channels from 2 to 4 chains apart on a grade of from 1 to 3 inches to the chain. These channels are large enough to carry a good irrigation head, that is, as much water as an irrigator can distribute evenly. This will vary from 100 to 250 cubic feet per minute. The field channels or laterals should be ploughed out the time the crop is planted. They may be made by ploughing two furrows away from each other or by using a double mould-board plough. (Fig. 1.)

In irrigating, these channels are dammed at distances varying from 1 to 3 chains by placing a temporary dam in the channel which stops the flow and causes it to run over the bank. The temporary dam may be

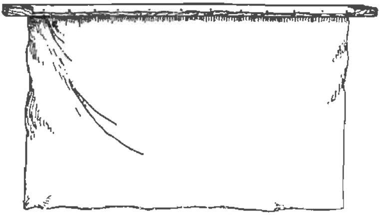


Fig. 2. Canvas Dam.

of canvas (Fig. 2), or it may be of earth made with a dammer (Fig. 3), which is run through the channel when it is made and after each subsequent irrigation, or these dams may be of manure faced with earth. If the lucerne has been drilled in the direction of the steepest slope it will help to secure an equal distribution. The water is allowed to run until the surface soil is thoroughly saturated, any excess which runs off being caught by the next lower lateral. The evenness of the distribution of water by this method depends on the freedom of the land from knolls; on the even flow over the top of the ditch; and on the skill of the irrigator in directing water to the highest parts of the field.

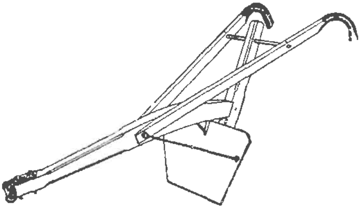


Fig. 3. Dammer used in Cleaning and Damming Field Channels.

This method of irrigating is well suited to grain and forage plants where the soil does not bake, but it is difficult to secure an even spread of water and the work of distributing is expensive and laborious. This has led to the use of checks where the land has a low enough grade to admit of their adoption.

2. FLOODING IN CONTOUR CHECKS.—Preparing the field for flooding by checks consists in throwing up low levees on approximate contour lines with cross levees at intervals to limit the area of the checks. This method is very well suited to the land around Kerang and in the Goulburn Valley, in both of which places the slopes are gentle, ranging from 9 inches to 4 feet per mile.

There are two essentials to this method of irrigation; the first is to have the levees low enough and broad enough to permit of farm machinery crossing over them, and the second is to make the checks small because in Victoria the surface soil does not permit of much grading to secure a level surface in the checked area. Another reason in Victoria for having small checks is the heat of summer and the need of removing the water quickly after the soil has become sufficiently moistened. From ½ an acre to 1½ acres is about the right size. In laying out the field in checks it should first be ploughed as deep as possible, without turning up the sub-soil, and on this lay out contour lines which connect points of equal elevation.

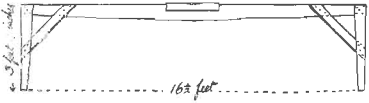


Fig. 4. Home-made Leveller.

Owing to the slight slope of much of the irrigable land in Victoria the difference in level of any two successive contours cannot be much more than 2 inches without making the levees too far apart; they should not be over 4 chains. The contours may be located with an engineer's level or the cheap drainage levels now being sold to farmers or by means of a home-made frame on which a carpenter's spirit level is fixed. (Fig. 4.) When the contour lines have been staked out they should be plainly marked by running a plough furrow along the stakes. The irrigator can use some judgment in rounding out the angles when he makes furrows.

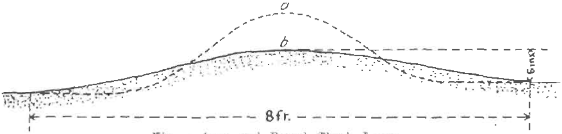


Fig. 5. Low and Broad Check Levee.
a. Appearance of levee when first made.
b. Appearance of levee after ploughing and harrowing.

The earth which makes the levees on these contours should *not* be obtained by creating furrows along their margins, as is so often done, but by scraping off the tops of knolls or hummocks. If more earth is needed, take it from the highest corner of the check so that when the levees are built the bottom of the inside is fairly level. After the contour checks have been built cross levees are put to divide the checked areas into basins of nearly equal and convenient size. In making the checks no instrument is better than the buck scraper, which is illustrated and described in Mr. A. S. Kenyon's article on Levelling and Grading in the June, September and December numbers (1907) of the *Journal*. The rotary scraper, made and used in Australia, will also do good work. A good home-made scraper is illustrated and described on pages 532 and 533 in Mr. Kenyon's article in the September issue.

The field is then ploughed, harrowed and seeded in the usual way, the checks being seeded with the rest of the field. The levees when first built will be relatively high (about 12 inches) and steep, but the subsequent

ploughing and harrowing brings them down to a low flat form, as shown in Fig. 5. Another levee is placed around the margin of the field to

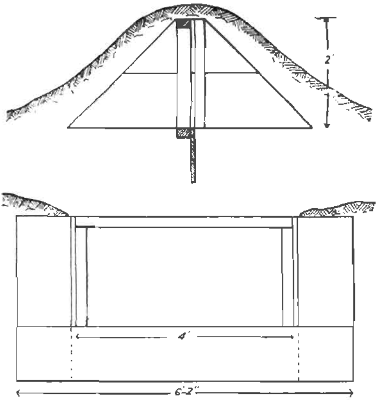


Fig. 6. Check Box; upper view shows Section across the Embankment, lower view lengthwise the embankment.

control the water within it and, when it can be done, it is a good plan to have a drain ditch at the lower side of the field to carry off the waste water. If checks are filled from each other, simple water gates are placed

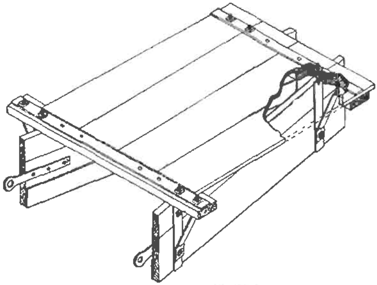
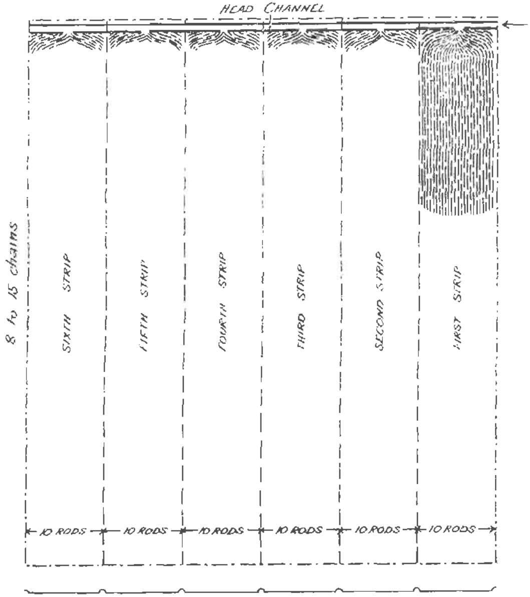


Fig. 7. Home-made Ridger.

in the levees at such places and distances as will facilitate the distribution of water. These gates are simply boxes, each having a bottom and two sides, with slats across the top to hold the sides in place. (Fig. 6.) About

the middle and on the inside of each side two cleats are nailed just the right distance apart to admit the sliding board or gate to pass up and down between them. These gates are about a foot wide in small work, and from 2 to 4 feet wide if a larger stream of water is available. Where cross levees are used to make smaller checks more gates are placed in the highest levee so as to allow the water to flow down in one direction and then in another until all the series have been filled.

In Victoria it will be the better plan to have a head supply channel crossing the field from which the checks on either side can be filled. Boxes should be placed in the banks of the levees to drain the water from the upper check into the one next lower, after the soil has been sufficiently moistened.



NOTE.—10 RODS ARE EQUAL TO $2\frac{1}{2}$ CHAINS.

Fig. 8. Irrigation by Border Method.

3. FLOODING BY MEANS OF RECTANGULAR CHECKS.—Flooding in rectangular checks differs from contour checks by having the levees in straight lines and the checked areas nearly uniform in size. It is not suited to the conditions in Victoria because it requires more grading of

the bottom of the checks than the contour method. This is expensive and involves too much disturbance of the surface soil. Furthermore in rectangular checks the levees have to be of varying heights and this makes it more difficult to pass machinery over them.

Rectangular checking is chiefly used in the irrigation of orchards and gardens. In this, making a furrow alongside the levee is not as objectionable as it is in lucerne growing, and the usual practice is to throw two furrows together with an ordinary walking plough. An implement known as a ridger can be used in light sandy soils. (Fig. 7.)

4. FLOODING BY MEANS OF BORDERS.—Land is prepared for irrigation by the border method by building low flat parallel ridges or levees from 1 to 3 chains apart across the field and in the direction of the steepest slope. (See Fig. 8.) The ridges are made in the same way as the checks in the contour check method, the aim being to make the space between the borders as nearly level as possible.

A head or supply channel runs across the field at the upper end of the strips and a large enough volume is turned out to cover the whole surface between the borders. This is kept running until the water has gone from two-thirds to three-fourths of the way down the slope when it is turned off. With a skilful irrigator but little water will waste at the lower side of the field. This method of irrigation requires a large flow of water, 600 c.f.m. is the quantity usually handled by one irrigator in California. Half that amount would answer in the clay soils of Victoria.

5. PERCOLATION FROM SMALL FURROWS.—Flooding by contour checks and borders is cheap and rapid and for land which will not run together and bake is the best method to follow, but for stiff clay soil it is an advantage to avoid wetting the surface, and where the surface is uniform enough to permit water to run down furrows without breaking over the sides and flooding the surface this plan has many advantages.

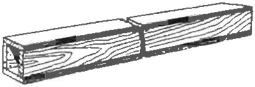


Fig. 9. Lath Tube for Ditch Bank.

To irrigate lucerne by small furrows the head ditch should run along the side of the field from which the most uniform slope can be obtained. This head ditch must be divided into level sections by means of drop boxes if the surface has much slope. The lower bank of each section of the head ditch must be graded off to an exact plane, which would be about 6 inches below the surface level of the water when the ditch is filled; on this are placed small tubes long enough to pass through the ditch bank and spaced the same distance apart as the furrows. This will vary from 1 to 4 feet, depending on the character of the soil. The tubes are commonly made by nailing four laths together. This gives a tube 3 feet long with an opening 1 inch square. (Fig. 9.) Tin tubes are sometimes used and in Ardmona a cheap tube is made from worn out gas pipes bought in Melbourne. For most Victorian soils the tubes should be placed about 2 feet apart. A man can set from 40 to 50 of the tubes in a day; an expert setter will place 80. Placed 2 feet apart there will be 660 in a ditch 80 rods long. If the furrows running from the opening are 80 rods

long the 660 tubes will serve 40 acres. After the tubes have been placed the ditch bank is built over them; this bank must be well puddled and rammed. The tubes are closed by putting a lath or shingle in front of them, and if they leak by putting a shovelful of earth in front of that.

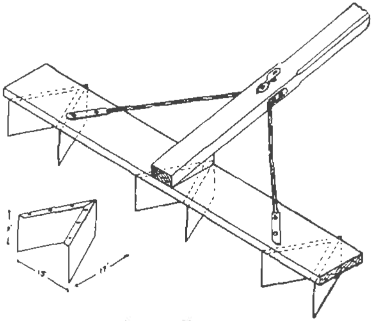


Fig. 10. Furrower.

Furrows run down the slopes from the tubes. The practice of irrigators varies much with respect to the depth and distance apart of these furrows. In furrows 2 feet apart they may be merely marks not over 3 inches deep and 4 to 6 inches wide. Fig. 10 shows one form of marker which can be weighted to make it sink into the ground to the desired depth; Fig. 11 shows another form of marker and Fig. 12 still another.

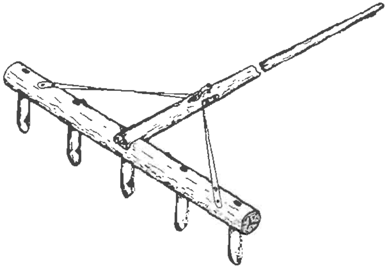


Fig. 11. Furrower.

The chief drawback to this method is the cost of making the tubes and placing them in the ditch bank. A simpler method is to put large wooden tubes into the sides of the head ditch from 30 to 70 feet apart. *These empty into a small parallel channel which opens into the field*

furrows. Fig. 13 shows a tube of this kind. Some of these are in use at the State farm at Wyuna. These tubes are made of four pieces of plank

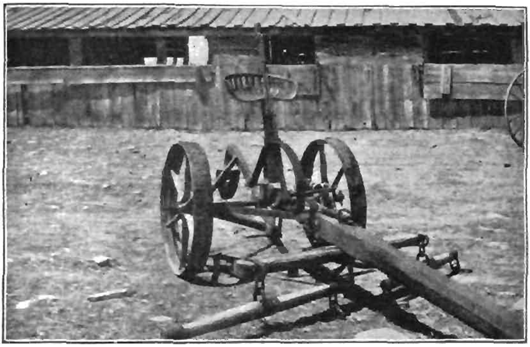


FIG. 12. FURROWER.

long enough to reach through the ditch bank and of such width as to give an opening of about 4 inches square, and are placed with the top about

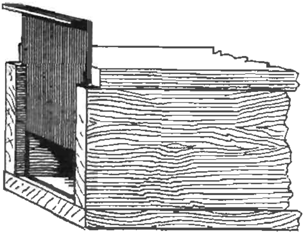


Fig. 13. Tube for Lateral Bank.

2 inches below the water surface when the head ditch is filled. An outline plan of this method of watering is shown in Fig. 14.

Preparing the Soil for Seeding.

Lucerne being a deep rooted plant it is desirable that the soil permit of the deep penetration of the roots and of moisture. In most cases this will be aided by sub-soiling and by a heavy top dressing of stable manure before ploughing and turning this under. Lucerne requires to be thoroughly pulverized. The number of efficient home-made tools for this work are illustrated in Mr. Kenyon's valuable articles. A modification of any shown there is the pulverizer (Fig. 15). This is an excellent tool for

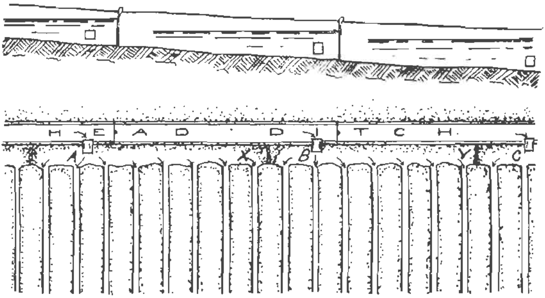
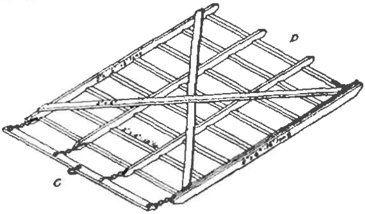


Fig. 14. Furrow Irrigation with large Outlet Boxes.

smoothing off inequalities in the land irrigated by field flooding from contour channels.



LAND GRADER

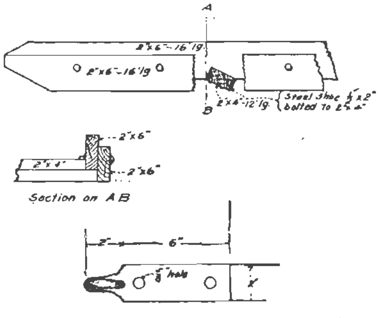


Fig. 15. Home-made Pulverizer.

IMPROVEMENT IN IRRIGATION PRACTICE.

Lucerne Hay Competition.

Elwood Mead, Chairman, State Rivers and Water Supply Commission.

The State Rivers and Water Supply Commission, with the concurrence of the Minister of Water Supply, has adopted a plan for co-operating with the irrigators of the Rodney and Kerang Districts in improving irrigation practice in the growing of lucerne for hay. This has been undertaken because of a belief that the value of farm lands in these districts and the profits of irrigation will be greatly increased if, to the area of lucerne now grown for pasture, there is added a large additional area on which lucerne is grown for hay.

Among the reasons for this belief are the following:—Lucerne hay is a superior winter food for dairy cattle and for growing animals of all kinds; it has few equals in the feeding of sheep and lambs; it will enrich the soil, and, grown in rotation with other crops, will increase the yield of all. The importance of the live stock industry and the extensive areas of grazing land in this State make lucerne an exceptionally valuable crop as a protection against loss in dry seasons. It can be stacked cheaply, and in this condition will keep without serious injury, in the dry climate of Victoria, for several years. It is believed that the area on which lucerne hay is grown will be rapidly extended if the yield per cutting can be increased and if the harvesting machinery and methods now employed in other lucerne growing countries are introduced here. It is the Commission's desire to aid in bringing about both these results. The cause for the small yield is not at present understood. It is certainly not due to climate, which is most favorable to the growth of this crop; nor does it seem to be due to lack of fertility in the soil, because of the large yields of wheat and flourishing growth of orchards, while chemical analyses show that there are large areas which contain all the elements for vigorous plant growth. The most probable explanation is that the restricted growth of lucerne is due to the compact texture of the soil and its tendency to form a hard crust when irrigated.

The great benefit which would come to agriculture in the State from being able to grow at a profit a reserve food supply for dry years makes it worth while for the State to take part in ascertaining how this may be done. Subsoiling, underdrainage, manuring and more careful preparation of the soil for irrigation and more skilful and sparing application of water are all worth trial.

The value of the demonstration and experimental work proposed to be carried on by the Commission, and at the Wyuna Irrigation Farm, will depend upon the active interest and co-operation of the irrigators in the State. Furthermore, the chances of success will be much greater if the farmers will undertake to solve this problem themselves. Their practical knowledge of the soil and climate and their experience in irrigating and cultivating crops cannot fail to be of great value in working out methods to produce a more vigorous growth.

As an encouragement to such efforts and to bring the work of the Commission and farmers into closer relations the Commission has decided to offer a series of prizes to the farmers producing the largest yield of

lucerne hay from five acres of land in each of the parishes of the Rodney Irrigation and Water Supply District; in the Irrigation and Water Supply Districts in the country around Kerang (excluding Swan Hill); and in Swan Hill, for the year beginning 1st April, 1908; and, if there is sufficient interest shown the first year, to continue these prizes each successive year for four years. The conditions to be as follow:—

1. There must be not less than five contestants for each prize.

2. Those wishing to take part in this competition must notify the Acting Secretary of the State Rivers and Water Supply Commission on or before 1st April, 1908.

3. The competition in 1908 will be restricted to land seeded after 1st March, 1908. The land should be located along a public highway if possible; but in any case its location must be definitely stated in the notice of competition.

4. The award will be made on or about 1st May, 1909; and will be based on—

(*a*) The total weight of hay cut and stacked between the time of planting in 1908 and 1st May, 1909. This to be determined by weight or measurement as the Committee on Awards may decide.

(*b*) Where two competitors tie for a prize so far as weight of hay obtained is concerned, the one using the least water shall have preference.

(*c*) The hay when cut must be stacked by itself near or on the plat where grown.

5. No conditions will be imposed as to the method of seeding, watering, tillage, or cutting. Each competitor will be left to use his knowledge and experience to the best advantage. But each contestant in the Rodney District must notify the District Engineer at Tatura, and each contestant in the other Districts must notify the District Engineer at Kerang, five days prior to each cutting of the crop.

6. The prize in each parish in the Rodney District and in Swan Hill will be a silver cup or a cheque for £5. In the Irrigation and Water Supply Districts in the country around Kerang (excluding Swan Hill) because of the large area included, the prize will be a silver cup of a value of at least £10, or a cheque for that amount.

7. The Committee on Awards will be:—

The Minister of Water Supply.
The Director of Agriculture.
The Chairman of the State Rivers and Water Supply Commission.
And two others to be announced later.

The Commission has prepared the attached form of Notice of Intention to Compete for these prizes, which may be obtained from the Acting Secretary of the Commission in Melbourne or from the District Engineers at Tatura and Kerang. If the number of the notices of competition received show sufficient general interest to warrant it, the Commission will arrange to hold public meetings at Tatura, Kyabram, Wyuna, Swan Hill, and Kerang to explain more fully the details of this work.

The Commission has been promised the co-operation of the State Irrigation Farm at Wyuna in carrying out experiments and demonstrations of the tillage and watering of lucerne for hay. This farm has now several sample plots of lucerne which show different methods of watering, and these will be supplemented by additional plots to be seeded hereafter. The Commission will, if satisfactory terms can be arranged, also endeavour to acquire control of 10 or 20 acres of land adjoining the towns of Tatura, Kyabram, and Kerang to illustrate the methods of preparing land for irrigation and to test the methods followed in important lucerne growing districts elsewhere. A practical irrigator familiar with these methods will be employed who will superintend the preparing of the land on these experimental areas and in addition, so far as his time permits, give advice and direction to individual irrigators.

NOTICE OF INTENTION TO COMPETE FOR PRIZE.

I, (A) of the parish of (B) Irrigation and Water Supply District wish to be enrolled as a contestant for the prize in lucerne hay growing instituted by the State Rivers and Water Supply Commission in (C) and do hereby agree to conform to all the rules and restrictions governing the said competition. Among others the following:—

To seed not less than five acres located as follows:—(D)

To notify the District Engineer at (E) five days in advance of the date of each cutting, and to stack the hay as required by the Commission and to leave it untouched until weighed or measured by the Committee on Awards.

To make a written report on a form, furnished by the Commission, of the dates of watering and cutting and the details of seeding and cultivation.

(Signed)

Post Office:

Date:

(A) *Here insert Christian name and Surname in full.*

(B) *Here insert name of parish and name of Irrigation and Water Supply District.*

(C) *In case of Rodney Competition insert name of parish. In other cases insert name of Irrigation and Water Supply District.*

(D) *Here insert precise situation of competing plot, giving number of allotment.*

(E) *In case of Rodney Competition insert Tatura. In other cases insert Kerang.*

To The Acting Secretary,
State Rivers and Water Supply Commission,
Melbourne.

FARM REPORTS.

QUARTER ENDED 31ST DECEMBER, 1907.

Rutherglen Viticultural College.

G. H. Adcock, F.L.S., Principal.

FARM.

CROPS, &C.—During the early part of the quarter the prospects for crops and grass were very discouraging. In consequence of the threatened shortage of fodder, the stock was reduced considerably by selling two truck loads of fat lambs and transferring as many cattle as possible to the better pastures at Whitfield. Fortunately a rainfall of over half an inch in October, followed by later welcome showers, greatly improved the crops which eventually turned out better than anticipated. Though the crops were short, yet having a large percentage of head, the quality as feed is excellent. Over ninety tons of hay from eighty acres were harvested. On the fallowed land we were fortunate enough to have the best crop in the district. This averaged over two tons per acre, thus proving conclusively, if proof were needed, the value of fallowing. While the return is low compared with what is secured in a favorable season, yet it is a matter for sincere congratulation that we have done so well. Many hundreds of acres of crop in this and other districts had to be abandoned to the live stock, being too short to cut or too poor to harvest. The hay obtained will again carry us over the year. In fact, with the exception of a small quantity of bran for an ailing horse, and molasses to render oaten straw more palatable, no feed has been purchased during the present management.

About six acres under *rye* produced an early filling for the silo. Subsequently, a second growth sprang up from the stubble, and gave further feed for the dairy cows. About the same area of *barley* was cut and converted into silage, in which form the cows ate both crops with avidity.

Peas did not succeed up to anticipations. This is to be regretted as they not only provide excellent fodder, but also improve the soil. The *tick beans* did somewhat better, but just as they were showing pods nicely hordes of locusts completely stripped the plot.

Advantage was taken of the rains that fell during December to break up a considerable area of stubble land and sow summer crops. This will give two crops for the year from that portion of the farm. Previously on virgin land we had about 25 acres sown with maize and sorghum. Here too locusts did some slight damage, but the recent opportune showers are bringing these crops along well.

Pumpkins, which are grown somewhat extensively for household use as well as for the cattle, have with the kindred plants, vegetable marrows, melons, cucumbers, &c., been seriously handicapped by the depredations of the Pumpkin beetle, whose ravages were both severe and widely spread this season.

The *lucerne*, of which about 5 acres were sown, was checked by the extraordinary dryness of the season, but since the rain it is doing better.

A small paddock of *rape* enabled us to top off the early lambs for the Melbourne market. The locusts paid this plot a visit too, and robbed us of a quantity of valuable feed at the end of the year.

STOCK.—*Dairy Cows*—The milk returns have fallen off consequent on the scarcity of natural grasses, since finishing the silage. A number of cows are not up to standard when judged by the bucket, and will have to give place to others more productive. On the whole the cattle have kept up well in condition, considering the season. About 30 calves have been reared.

Sheep.—These are doing well and are a profitable branch of our operations. We had some of the finest lambs in the district. The shearing was completed earlier this year than last. Mr. Tyrrell generously placed his shed with its equipment at our disposal. The wool sold well viz. 11½d. Besides the lambs already sold there is another lot ready for sale.

Horses.—Two years ago we had 5 draught horses. There are now 8 and a splendid colt coming on. Two draught and one light mare are in foal.

CLEARING.—A contract for grubbing stumps on a portion of the College estate has been let to Mr. J. Dow. This work has been undertaken by means of a powerful traction engine. Owing to the dry year and the fact that the subsoil never had a soaking, it has been difficult to remove the stumps which furnish no leverage. However, a considerable area has been grubbed and will be put under the plough as soon as possible. Another portion of the College land is being broken up with disc ploughs and a traction engine.

VINEYARD.

The chief work for the quarter in the vineyard has been the disbudding of the American vines. Owing to the rapid growth of laterals, this takes up a lot of time and in fact seems almost an endless task. The cuttings too small for grafting were planted out to root, and the strike has been fairly satisfactory for the season. The reconstituted plots of Shiraz, Malbec, Cabernet, and Burgundy are showing a fair crop. The plot of imported varieties is also doing well. Thorough cultivation of these nurseries and plots receives constant attention as it is an important rule at both establishments that scarifiers and cultivators are not to have a chance

to rust out. Owing to the exceptionally dry winter there will be a falling off in the number of cuttings for the coming season.

WAHGUNYAH NURSERY.

About 10 acres have been trenched, laid out and utilized as a nursery for the growth of the grafted cuttings. It would have been much better if we could have had the land cleared earlier as planting nursery stock immediately after the removal of green timber, before the ground has time to sweeten, has its drawbacks. A considerable amount of work has been undertaken at the nursery during the quarter, and represents our concentrated efforts for some time. Owing to its distance—some 12 miles—it is somewhat difficult to work in connexion with the head station. The telephone will minimise this difficulty. A cottage for the officer-in-charge, and "barracks" to accommodate a dozen boys and their supervisors, have been erected. The lads sent over to assist in the planting out of the grafts, rendered valuable help.

PLANTING THE CALLUSED GRAFTS.

During the whole time of planting the weather was exceptionally unfavorable. No rain of any consequence fell for months. It was one of the driest and most trying seasons on record in this respect. To add to climatic difficulties, we had to remove most of the grafts from the College frames. Every care was taken to keep them from drying, by packing in moss, &c., yet their removal, the necessary handling, and inevitable exposure, though reduced to a minimum, were not conducive to the best results.

As soon as the grafts began to show above ground we were unfortunate enough to lose a large number of the successful grafts by "cutworms" which have been exceptionally prevalent this year. These pests ate through the young shoots. As they carried on their destructive work below the surface, it was impracticable to destroy them with poisoned baits as is successfully done when they come above ground to feed.

No sooner had we got rid of the cutworms than we had a serious visitation of locusts. Not only ourselves but several vignerons suffered severely from the depredations of these invaders. Everything green in their line of flight disappeared. We were congratulating ourselves that the vines would

shoot again under the influence of the rain which happily fell. Hardly had the green shoots again appeared when a later invasion took place just before Christmas. These seemed bent on destroying what their forerunners had left. Up to the end of the year we had not quite got rid of these voracious pests which irretrievably damaged our grafts.

Besides what may be considered the legitimate work of the nursery we have erected the necessary buildings and installed a first class pumping plant for watering the vines. The construction of buildings, laying of the pipes, fixing engine and pump, erection of tank stand, &c., were all undertaken and successfully carried out by the College staff. The pump will raise 200 gallons per minute and as we pump direct from the Murray we have an unlimited supply to draw from.

BOYS.

The work of training the lads sent for the purpose proceeds steadily but none the less surely. Excellent opportunities are afforded them to become proficient in the various branches undertaken here. Judging from reports of those sent out to situations we have not been altogether without success.

During the term under review we had 23 boys in residence at the College. They materially assisted in the grafting as well as the planting out of the vines, and did the greater part of the disbudding among the mother stocks. Their conduct is on the whole good. Many of them show an increased interest in their work. The senior boy left in November to take a situation on Mr. Campbell's orchard, near Stawell.

On the 20th December, the second annual distribution of prizes was held. The subjects for which awards were given were varied, consisting of agricultural, viticultural, and general topics. The work done, both theoretical and practical, was highly creditable, and bore eloquent testimony to the value of the training, to the attention paid to the lectures delivered, and to the character of the information retained.

Wyuna Irrigation Farm.

G. H. Tolley, Manager.

CROPS.—As anticipated in the previous quarterly report, the crops where not irrigated, were mostly failures. Whilst the district yearly average is 26 inches, the rainfall for 1907 amounted to 12.06 inches only. This total was exceeded in 1906 during the last *6 months.* In the case of 84 acres of timber land (42 acres sown with Purple Straw wheat, 28 acres Algerian oats and 14 acres Cape barley) which previously carried a heavy crop of rape, only a few acres were fit to cut for ensilage and the stock were turned into the remainder. Five acres of Prairie grass on virgin land failed completely and 5 acres of Federation wheat sown late on similar land yielded a little for ensilage. The yield from 43 acres sown to Federation wheat on plain land previously fallowed with rape was about a bag to the acre of very good grain. (Most of this will be made available to Wyuna settlers for seed). Great care had been taken in sowing this plot, varying quantities of manure being used; it is a disappointment that the results have been vitiated by the season. To draw definite conclusions from these results would be idle but it is certain that the crops following the rape fallow were far inferior to those on bare fallow.

The other crops on plain land were 5 acres of Cape barley following a crop of wheat, and 5 acres of Algerian oats following a crop of maize. These were partially irrigated and yielded a fair amount of ensilage. The remaining crop of 40 acres, Purple Straw wheat and Algerian oats at the rate of half a bushel to the acre, was sown as nurse to lucerne on virgin land in bare fallow, and was partly irrigated during the latter half of September. The yield was good both in quantity and quality and was mostly used for silage purposes. Altogether 90 tons of silage, and 7 tons of hay were secured.

As regards the lucerne there is a fine stand on almost the whole 48 acres sown and a first cutting will be made during the first week in January. From present appearances, the most successful plot (45 acres sown in May and 3 acres in September) is that without any nurse crop; that sown with wheat next, and lastly that sown with oats which shows marked inferiority. The results as regards quantity of seed and manure sown, drilling or broadcasting will not be sufficiently definite until a few cuttings have been made. Later on it is intended to publish the results, together with diagrams of the plots showing how they are laid out and fitted up for irrigation. The object aimed at is to make the operation of irrigating as far as possible automatic. The fitting up of the irrigation ditches is being proceeded with as fast as circumstances admit. The difficulty of obtaining water for irrigating which was very acute in the early part of the season has entirely disappeared; the supply is now adequate and the completion of the main eastern channel will make it assured.

Of *summer crops* 4 acres of mangolds and tick beans sown towards the end of August failed for lack of moisture. The area was resown with white and brown Kaffir corn and is promising. Other summer crops are 1 acre of mangolds, 1 acre of Kaffir corn, 6½ acres of amber corn, and 8 acres of millet, which, with the exception of the latter also show fair promise. Further areas are about to be sown.

STOCK.—*Dairy Cattle*—Sold three cows for slaughter, reducing the herd to 42. The average number milked weekly is 23.4; the average yield for same period being 2925 lbs. The natural increase has been 7 bulls (killed), and 6 heifers.

The stud bull was exhibited at the Tatura Show and was awarded first prize.

Pigs have been increased by the purchase of 10 slips, and naturally by a litter of 4 from a young sow. 7 baconers will be ready for market in a fortnight.

Poultry.—The natural increase has been satisfactory and includes a first class strain of Pekin ducks.

BUILDINGS.—By the middle of January the new milking shed and yards, with the exception of installing milking machine, will be ready for occupation. Foundations for the new dairy and boiler house are finished. A new 100 ton timber silo has been built and the capacity of the existing one increased to the same amount. Plans for the new brick and iron pigsties and brick manure pit have been prepared and the material is on the ground. A contract for new netting fence along Eastern boundary of farm is nearing completion and several subdivision fences have been erected.

MISCELLANEOUS.—Four kilns each containing 30,000 bricks have been burnt and a fifth kiln is almost ready for burning, after which the manufacture will be discontinued until further necessity arises. Settlers

continue to avail themselves of the use of the farm tools and implements, and assistance has been rendered them in laying out irrigating ditches and determining the levels of the land. Grading implements have been exhibited at various shows and in some cases demonstrations given.

On the 17th October a lecture on "Poultry Raising" was delivered by Mr. H. V. Hawkins.

Soil samples have been gathered and sent to the laboratory for analysis and moisture results.

Mount Xavier Experimental Farm.

A. Kenny, Manager.

Crops.—*Hay.*—The hay crop (18 acres)—part Algerian and part Tartarian—has been cut, the Algerian being stacked and the Tartarian is still in stook. It was predicted by the general public that no crop would be cut in consequence of the very late sowing, and the very poor quality of the soil. The season was also most unfavorable, September and October being very dry went very much against the crop. The November rains helped considerably, and the result will be about 1 ton of excellent hay to the acre.

Peas.—The pea crop (about 9 acres) was sown the first week in September—late for this district. Six acres were ploughed in and potatoes planted whilst the other 3 acres are being threshed for seed for next year. The heavy rain came on just as they were ready for pulling, and a great number were lost through shelling. The ground will be ploughed immediately, and sown with a mixture of barley and rye; with the self-sown peas this will make excellent green fodder.

Mangolds.—The first week in October 2 acres of mangolds (Long Red and Mammoth Globe) were sown. The land was well prepared, being well ploughed, harrowed and rolled, and formed an excellent seed-bed. The plants appeared in due course, but after a couple of dry, hot windy days they were scorched off. Maize was sown instead.

Potatoes.—About 6 acres of Snow-flake potatoes are planted. They are looking well, the stalks being strong and healthy where the original soil had not been disturbed by the miners; whilst the other parts (clay and sludge patches) are weakly, but will come on if we get good February rains. From appearances a very fair average crop will be obtained.

Maize.—The maize crop (about 12 acres) is looking exceedingly well, especially in those parts where patches of the original soil had not been disturbed by the miners. Other parts, where gravel, tailings, and slum have been mixed up, are not doing so well. About $1\frac{3}{4}$ cwt. of superphosphate and nitrate of soda per acre have been put in with the maize. The crops generally on this very poor land have surprised the visiting public, and have been watched in Ballarat with keen interest. The critics were entirely out in their opinion, which was generally that "no crops would be harvested this year." The result has been very satisfactory considering the late start that was made with the hay crop and peas and the very dry spring—there was scarcely any rain during September and October.

The principal work at present is cultivating and hoeing between the rows of maize and potatoes. The scarifier and hoe are kept constantly going, and the land kept open and friable on top. The recent rains have been of great benefit to the maize and potatoes.

Stock.—The horses are doing exceedingly well, and are in splendid working trim. No cattle or pigs are yet on the farm.

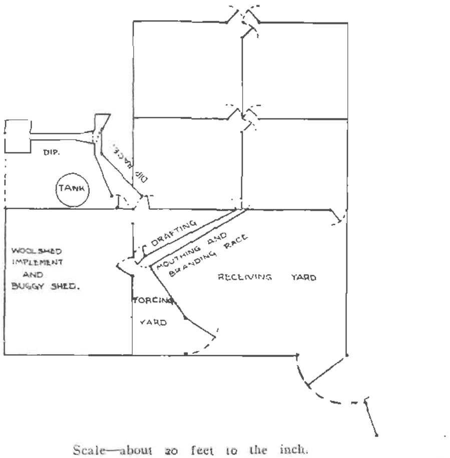
New Work.—A large scheme of work is contemplated for the coming year. All the available ground will be ploughed over immediately.

I desire to place on record the commendable interest taken by Mr. Willoughby, the working manager.

FARMERS' SHEEP YARDS AND DIP.

H. W. Ham, Sheep Expert.

Similar yards to those illustrated may be found in many of our chief lamb-raising districts, and are usually worked by one man and a dog. As sheep will travel much better with the wind in their face, the yards should be arranged so that the race will run to the quarter that the wind mostly blows from. If it is possible to have them running up-hill a little, so much



Scale—about 20 feet to the inch.

the better. Such yards, made smaller or larger, as found necessary, are suitable for working flocks containing from three hundred to two thousand sheep. Yards built on the above scale will be adequate for one thousand sheep.

As shown in the sketch, the woolshed should adjoin and so save the expense of a second lot of yards. The roof can then be used to supply the water for filling the dip, which should be in close proximity to the shed.

THE ORCHARD.

James Lang, Harcourt.

The extreme heat experienced throughout the whole of January has been very trying to the orchards. Fortunately there was a splendid rain on the 27th December which gave the ground a thorough soaking; had this not been the case the effect of the extreme heat on the fruit would have been most disastrous. As it is, the effects have been felt in some districts; plums especially have suffered severely, large quantities being scorched on the trees. Apples and pears have also suffered, but to a lesser extent than the plums.

It is astonishing how orchards that have been kept in good condition by continuous scarifying have retained the moisture in the soil. One in particular that has come under the notice of the writer has shown no sign of the extreme heat, the soil a few inches under the surface being still moist, and the trees green and vigorous.

Orchards that can be irrigated during the summer months have a great advantage over those that cannot be so treated; the fruit grows on without a check, and the trees are also left in much better condition for next year's crop.

Gathering and marketing the fruit will occupy a good deal of the time of the orchardist. As the season advances the shortness of the crop becomes more apparent and good prices are likely to rule for the rest of the season.

From the accounts which have come to hand from London and Germany, those markets are extremely bare of apples, and high prices are expected to be realized when the Australian shipments arrive. Shipping agents are now offering good prices for apples, 6s. 3d. per case, being offered f.o.b. Melbourne. If it pays agents to offer these prices, it will also pay the grower to ship on his own account. Growers who ship good fruit, well packed and graded, may therefore expect to realize full value on all their consignments.

Spraying for Codlin Moth will still require attention; two more sprayings should be given by the end of the month. The bandages should also be attended to; look over them every ten or twelve days and destroy all grubs. It is no use bandaging the trees if they are not looked over regularly, as it only provides more harbor for the propagation of the moth.

Citrus fruits will require constant attention by watering, as they soon suffer if the soil is allowed to become dry.

Budding should be done this month. Where the soil is dry a good watering should be given a few days before budding takes place; the bark will then run freely and the operation will be more successful.

Numerous complaints have been received about the ravages of the green parrakeets in the orchards. They are very much worse this season than usual, owing to the scarcity of their natural food. The best way to deal with this pest is poisoning with strychnine. Crush the strychnine crystals into a fine powder like flour; then dust a little of it on apples the parrots have partially eaten. It is the habit of these birds when they have started on an apple or pear, to go back to it again till it is finished, so these are the ones that should be dusted with the strychnine. If there are not enough of these get a sharp pointed stick and scarify some of the good apples and dust them with the strychnine. Great caution must be exercised in laying the poison especially if there are children about so that no mishap can occur.

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REPORT ON HARVEST OF EXPERIMENTAL WHEAT FIELDS, SEASON 1907.

F. E. Lee, Agricultural Superintendent.

The harvest returns under review represent the third season's work on the experimental wheat fields conducted under the supervision of the Field Branch.

It will be remembered that 26 fields of 10 acres each were established in 1905, arrangements having been entered into for the continuance of the work over a term of seven years. The first season's work embraced trials of artificial manures in varying amounts and combinations; cultivation methods, including subsoiling and green manuring; the trial of 40 wheat and eight oat varieties, and the growth of green fodder and root crops. Portion of the land was fallowed during the second season, portion cropped with rape and the balance resown with wheat varieties.

As the result of the trials of the wheat varieties during the two seasons, Federation showed itself to be well adapted to the conditions of most districts and in order to permit of any lingering doubt being removed from the minds of farmers, it was decided to again test this variety on a larger scale against any other variety the farmer might choose. Concurrent with this variety test, a trial of three different methods of fallow was included in such a way that both wheat varieties were side by side upon the differently fallowed portions. The results given on the next page are the outcome.

Criticism of Results.

At first glance the average yields for each classification, as well as the average for all fields, may appear low, but it must be remembered that the wheat season just past was an exceptionally unfavorable one. Almost continuous rain fell during sowing and much of the seed on heavy clay land was lost by rotting. As the season progressed dry weather set in and the spring was unusually dry. A late rain in October was most beneficial and there is little doubt that without this rain some of the crops would not have been worth harvesting. As it was, the heads filled well and the sample of grain was very fair.

HARVEST RETURNS OF WHEAT VARIETIES, SEASON 1907.

Name.	SECTION A. Ordinary Bare Fallow.		SECTION B. Subsoil Fallow.		SECTION C. Rape Fallow.		Name of Farmer's own Wheat.
	Federation.	Farmer's own Wheat.	Federation.	Farmer's own Wheat.	Federation.	Farmer's own Wheat.	
MALLEE AND FRINGE.							
Mudge, Sea Lake ..	8.3	6.1	9.6	6.9	6.5	4.1	John Brown
Williamson, Boort ..	9.6	6.1	7.0	4.7	6.7	5.6	Hudson's E. P. Straw
Innes, Rainbow ..	17.5	18.4	17.9	16.3	15.5	12.0	Dart's Imperial
Barber, Birchip ..	9.0	8.2	9.9	9.1	8.8	9.7	Jade
Allen, Willenabrina ..	2.2	3.0	2.0	2.1	3.4	2.9	Dart's Imperial
Lavery, Watchem ..	9.3	8.1	8.9	7.2	11.7	10.6	Dart's Imperial
Bennett, Warracknabeal	28.5	25.9	27.9	25.2	12.2	16.0	Sullivan's Early
Whitney, Jeparit ..	16.0	19.6	17.8	16.3	18.0	18.1	Dart's Imperial
Milbourne, Warracknabeal	2.2	2.8	2.0	3.8	4.6	3.6	Dart's Imperial
Average of 9 fields ..	11.4	10.9	11.4	10.1	10.0	9.1	
WIMMERA.							
Longerenong College ..	31.1	26.2	33.0	26.9	31.0	28.2	Warden
Tepper, Coromby ..	22.0	18.4	18.0	16.9	13.0	15.4	Silver King
Feery, Dimboola ..	17.0	8.3	12.7	6.9	13.5	7.3	Dart's Imperial
Nowatna, Jung ..	23.1	21.7	22.6	19.2	22.3	18.1	Dart's Imperial
Gibbins, Wail	13.9	16.2	18.4	21.5	18.9	17.2	Steer's E. P. Straw
Boyd, Minyip	5.9	4.7	5.4	4.7	4.6	4.5	Dart's Imperial
Hutchings, Lubeck ..	*16.0*	*21.4*	*19.0*	*22.2*	*18.6*	*17.5*	*Marshall's No. 3*
Pilgrim, Nhill	..	..	16.4	12.2	10.6	24.8	Marshall's No. 3
Average of 8 fields ..	18.4	16.7	18.1	16.3	16.5	16.6	
NORTHERN PLAINS.							
Pollard, Glenloth ..	2.9	4.5	5.1	4.9	3.7	1.9	Dart's Imperial
Carter, Marong ..	15.4	16.7	14.7	17.4	17.1	20.0	Dart's Imperial
Sproat, Donald ..	23.1	18.9	25.5	20.9	25.7	17.1	Darr's Imperial
Hunter, Elmore ..	11.8	14.7	13.5	17.1	16.1	14.4	Purple Straw
Trewick, Elmore ..	5.9	6.3	6.3	5.6	7.3	16.1	Purple Straw
Nixon, Eddington ..	16.6	12.7	15.0	14.0	13.2	11.3	Dart's Imperial
Howard, Bet Bet ..	5.9	4.0	6.3	4.2	3.7	3.2	Dart's Imperial
Bray, Merrigum ..	10.8	6.2	8.9	8.7	8.4	8.0	Dart's Imperial
Sharp, Goorambat ..	22.8	19.7	21.0	21.6	20.6	18.8	Bluey
Average of 9 fields ..	12.8	11.5	12.9	12.1	12.8	12.3	
Average for whole State	13.8	12.7	14.0	12.9	13.0	12.5	

THE VARIETY TEST.

The exceptional yield of the Federation during the two previous seasons, combined with its special characteristics of short straw, ability to withstand storms and comparative earliness of maturity, was sufficient for the Department to recommend this variety in a guarded fashion, and some 40 bags of genuine seed were purchased and distributed in small

parcels throughout the wheat areas. It will be noted that the seed furnished by each farmer as a test against the Federation includes all the familiar varieties.

MALLEE.—In the Mallee the average yield of Federation, on each class of fallow, has exceeded that of the local wheat from ½ to over 2 bushels per acre. The only notable case of reversal in this direction was at Jeparit where Mr Whitney's Dart's Imperial showed very similar yields, and in one section a superior yield to the Federation. A partial explanation for the latter might be found in the fact that sparrows invariably attack the edges of a crop, and the Federation ripening a little before other varieties in the same locality was particularly susceptible to this bugbear of the experimentalist.

WIMMERA.—It will be remarked that these fields have produced the highest yields—due without doubt to the better season prevailing in the western portion of the State. In only two instances—Messrs. Gibbins (Garup) and Hutchings (Lubeck) was the seed furnished by the farmer superior in yield to the Federation. As a set-off to this, the field at the Longerenong Agricultural College showed an advantage of from 3 to 6 bushels per acre in favour of the Federation. The most noticeable superiority of the Federation over the Dart's Imperial seed furnished by the farmer occurred on the farm of the late Mr. James Feery at Coromby, near Murtoa, where the yield of the former is almost double that of the latter. Accepting the returns as they stand there is abundant testimony to the suitability of the Federation over all other varieties of wheat in the Wimmera.

NORTHERN PLAINS.—This embraces all the fields east of Donald and includes Wycheproof, the Goulburn Valley and North Eastern districts, where the severity of the late dry season was most intensely felt. As a consequence the average yields are lower than they would have been in a normal season. Nevertheless there have been some excellent crops, notably at the farms of Messrs. Sproat (Donald) and T. R. Sharp (Goorambat). The average returns show a superiority in favour of Federation of from 1 to 1½ bushels per acre.

I am in possession of reports from the majority of the experimenters to the effect that they are well pleased with the general characteristics of Federation. Its one draw-back, if it can be correctly termed so, is that the straw is too short for hay. This I am inclined to think is its most favorable feature. There are plenty of other wheats more suitable for hay. Where grain is the object, only those varieties of the most prolific yielding capacity should be grown. One interesting fact in connexion with Federation was learnt during my recent visit to the New South Wales Government Experimental farms, and that is owing to the early period at which the ear emerges from the sheath, it is somewhat prone to suffer from the effects of frost. It is therefore recommended that where Federation is sown as part of a farmer's area it should be the last to be put in. The month of May is more suitable than March or April for sowing.

A recent inspection of new Mallee land bearing a first crop of wheat leads me to believe that Federation will succeed better than any other variety on this class of soil on account of its shortness of straw and compact head.

COMPARISON OF METHODS OF SOIL TREATMENT.

It must be confessed at the outset that the results of the experiments just concluded are distinctly disappointing as regards the throwing of any

light upon the problem of soil treatment. This factor is, in my opinion, the only foundation upon which permanent success in agriculture can be built up, hence the comparison of the farmer's own method of bare fallow with the systems of rape fallow and subsoil fallow. The two last-named, particularly the latter, are not universally practised in the wheat growing districts, although common enough in other parts of the State for other crops. Taking the mean yield of both wheats under each kind of soil treatment as representing average conditions, some interesting food for thought is revealed.

District.	Ordinary Bare Fallow.	Subsoil Fallow.	Rape Fallow.
Mallee and Fringe ..	11.1	10.7	9.5
Wimmera	17.5	17.2	16.5
Northern Plains	12.1	12.8	12.5
Average	13.5	13.5	12.6

It will be noted that in the Wimmera and Mallee, the ordinary bare fallow has produced superior returns to the subsoil fallow and the subsoil fallow superior returns to the rape fallow. In the Northern Plain districts, on the other hand, the subsoil fallow takes precedence over the rape fallow and bare fallow in that order. These figures are doubly interesting when contrasted with identical experiments on these same fields in 1905. At that time all the seed was furnished by the farmer, and the results as set out below indicate a very close resemblance to those of the season just passed.

SEASON 1905-6.

District.	Ordinary Bare Fallow.	Subsoil Fallow.
Mallee and Fringe ..	15.4	14.0
Wimmera ..	22.2	18.2
Northern Plains ..	20.1	22.3

Under any circumstances, the results of two seasons are insufficient to establish any concrete facts, and it may not be out of place to again urge patience until the completion of the experiment in 1911. There is, however, sufficient evidence to lead one to believe that on certain types of soil, subsoiling or deeper cultivation may be of service in insuring an increase in the yield of wheat sufficient to justify the extra cost of preparation. It is unlikely that in the matter of subsoiling alone, will be found the solution of the problem of low wheat yields, but undertaken in conjunction with more prolific yielding wheat varieties and a scheme of crop rotation there is every reason for thinking that better results will ensue.

EFFECTS OF SUBSOILING ON THE GROWTH OF THE WHEAT PLANT.

Whatever may have been the effects of subsoiling on the production of grain, it certainly showed to advantage in the increased growth and

vigor of the plant. On the whole, the stooling was a little better, and flag more abundant. Germination in many cases was also more advanced than on either the bare fallow or rape fallow. The soil itself on the subsoiled portion was more mellow and worked up finer.

I anticipate that the effects of the subsoiling will last another year, after which that portion of the fields will be worked up deeply again.

GENERAL REVIEW OF THE WORK UP TO DATE.

After three seasons' work on these fields, a review of what has been achieved and what features promise to reveal themselves in the future is interesting.

The most useful purpose of the fields so far has been the demonstration of the superiority of Federation wheat over all other varieties grown alongside it under identical conditions. This in itself has already had an appreciable effect on the wheat production throughout the State, and when more universally grown its suitability to almost every class of soil will be manifested. Another valuable object lesson, in the direction of soil treatment, appears likely to be furnished as the experiment progresses. Manure tests have confirmed the superiority of the superphosphate over other forms of phosphatic manures, and furthermore demonstrated the inutility of using more than from 50 to 70 lbs. per acre. The addition of nitrogenous and potassic manures has not produced sufficiently increased yields to justify the extra cost of application.

On the whole, while much yet remains to be done, the experimental work has justified its practical worth to the wheat farmer, and I am hopeful that the work projected in the future will further demonstrate the fact that the Department is in entire sympathy with the wheat farmer, and will not permit any reasonable expense to stand in the way of solving the problems of his industry.

ABSCONDING SWARMS OF BEES.

R. Beuhne, President, Victorian Apiarists' Association.

The absconding of swarms is a source of annoyance to the beekeeper at any time and during, or just before, a honey flow it is a serious loss.

There are quite a number of causes which induce bees, after swarming and hiving, to swarm out once more and depart. Occasionally it may also happen that a swarm will issue from a hive and fly straight away without first, as swarms usually do, settling in a cluster on some object not very far from the hive. A swarm which absconds without first settling is nearly always from a hive which by some means has lost its laying queen and the queen which accompanies the swarm is a virgin queen raised from the brood which was left when the old queen died or failed. As it takes sixteen days from the egg to the emerging of the queen, and a few more days before the young queen is ready to take wing, very little if any brood will be left when she takes her mating flight, which is about five days after hatching. As she leaves the hive the bees follow as a swarm and usually depart with her. It is of course impossible to entirely prevent

this kind of absconding, for every hive cannot be examined often enough to discover the loss of a queen, but whenever a colony is found in which the presence of queen cells and the absence of eggs indicate queenlessness, all the queen cells except one of the best developed should be destroyed. After the young queen has emerged, one, two or three combs (according to strength of the colony) of eggs and young larvæ from other colonies able to spare such, should be given. The presence of this young brood will hold the bees, that is, prevent them going with the queen when she leaves the hive for the purpose of mating.

This practice of breaking out surplus queen cells and giving young brood after the only remaining cell has hatched is also the best way of preventing the issue of after-swarms from hives which have thrown a first or prime swarm and from which further swarms are not desired.

In the case of ordinary box hives which owing to the absence of frames cannot be dealt with in the way described, the same object may be attained, but with less certainty by placing the newly hived first swarm on the spot occupied by the old box after having removed the latter to a new stand. This causes most of the old bees which still remained in the parent hive when the swarm issued, to join the swarm because it occupies the spot to which they fly when returning from the fields. Thus only bees which have never yet been flying out remain in the parent hive which in consequence is not able to cast another swarm when the first of the queen cells hatches. The first emerging queen is therefore allowed by the bees to destroy the remaining queen cells. When a colony swarms before any queen cells are sealed, and there is much brood in the hive, sufficient bees will have become of field age during the extra length of time which must elapse before the first queen hatches, to bring the colony to swarming strength and a second swarm may result notwithstanding the removal of the colony to a new stand when the first swarm issued.

Much of the absconding of swarms which issue in a normal season could be prevented by the owner of the bees if he were aware of the causes which bring it about. One cause is leaving the swarm too long before hiving it. A normal swarm usually settles somewhere not far from the old hive. After an hour or so scouts go out looking for a place to found a new home, and after such has been found the swarm will often persist in turning out after hiving and perhaps finally absconding to the place selected. Other causes of swarms refusing to stay when hived are excessive heat, want of ventilation, annoyance from ants or robber bees, or an objectionable odour of the box, that of kerosene, for instance.

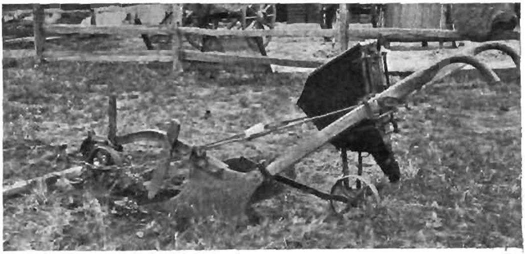
The bees of a swarm are in a state of excitement and the box in which they are hived should be well shaded and given a large entrance for three or four days. It should also be free from odours or stickiness of honey, which would attract ants or robbers.

Turned out swarms are more troublesome than swarms issuing for the first time. In the latter case the bees are gorged with honey and therefore heavy; they settle low and are seldom inclined to sting. On the other hand bees swarming out of an empty hive after having consumed the honey they carried are light on the wing, often settle in inaccessible places, sting more readily, and frequently abscond.

A COMPACT AND CHEAP SEED DRILL FOR THE SMALL HOLDER.

A. S. Kenyon, C.E., Engineer for Agriculture.

A good market exists for a reliable and cheap seed drill, particularly so in the case of maize, peas and other large sized seeds which are specially the crops of the small holder. The ordinary hoe or disc drill is too expensive and requires considerable strength; while it cannot be said that it sows maize and similar grains as satisfactorily as might be desired. Mr. Tipton, of 499 Swanston-street, Melbourne, has patented a manure and seed drill combined which may be readily attached to a single or multiple furrow plough or to any of the ordinary makes of cultivators. It is not novel in principle unless for the manure attachment; but is a practicable appliance. Its working is controlled by a small driving wheel, provision



A COMPACT AND CHEAP SEED DRILL.

being made for passing over bumps and rough ground without affecting its action. The body is divided into two compartments, one holding seed and the other manure. Distributing plates of various sizes may be fitted in to sow seeds of any size from lucerne to beans, and in varying quantities. The amount of fertiliser is also under the control of the cultivator who may allow it to run in every furrow, while cutting off the seed for any required number of furrows so that the drills will be the proper distance apart for cultivating. The sowing of the maize grain in the bottom of a furrow with the considerable cover given by the furrow slice sod turned over it, is held to be good practice by many agriculturists, and has in actual work given very good results both as to percentage of germination and as to strength of growth of the young plant. For the sowing of smaller seeds which is done at any desired height on the slope of the previous furrow slice, it appears to give good results, the germination of such seeds as the millets being particularly good.

Although as a general rule, the sowing of the seed at the same time as the ground is turned over, cannot be advocated, yet for the requirements of the small holder, of the suburban dairyman and others, this

implement has distinct advantages. Its price with one set of sowing wheels is £4 10s.; extra wheels are fifteen shillings each so that for a complete machine, to sow from the largest to the smallest of seeds, the total outlay will be about £6.

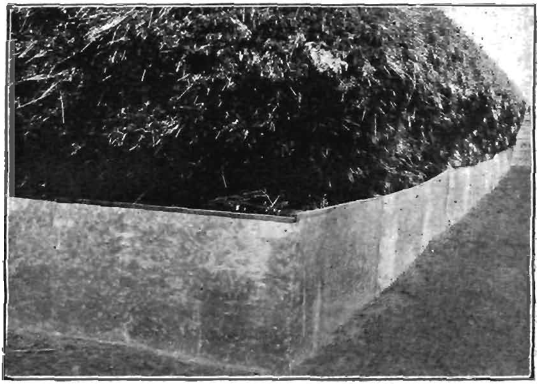
MOUSE-PROOF STACK SITE.

G. A. Sinclair, Principal, Longerenong Agricultural College.

The accompanying illustration is that of a mouse-proof stack site erected at the Longerenong Agricultural College by the students under the supervision of the Farm Manager, Mr. Martin:—

The outside measurements are 76 ft. 6 in. by 41 ft., which gives ample room for a stack of 150 tons. From the outside of each corner-block to the centre of the next block, the distance is, in the direction of the length, 5 ft. 11¼ in., and in the direction of the width 5 ft. 9¾ in.—this sheet laps around the corner of the blocks 1½ in. The distance apart of all the other blocks is 5 ft. 10½ in., centre to centre, which allows 1½ in. for overlap in the iron. We used twenty 12-ft. lengths of 3 x 1 hardwood, let in flush with blocks at the top; forty sheets of plain iron, 6 ft. x 3 ft., sunk six inches in the ground, the portion below ground being tarred; and forty blocks, 9 x 4½ in., cut from old sleepers, sunk 2 ft. in the ground.

The cost, exclusive of labour, was:—Iron, £9 6s.; hardwood, 7s.; sleepers, 12s.; nails, 2s. Total, £10 7s.



MOUSE-PROOF STACK SITE.

FARM REPORTS.

QUARTER ENDED 31ST DECEMBER, 1907.

Heytesbury Farm.

O. H. Call, Manager.

CROPS.—A small plot of *rape* was sown early in October and has done fairly well, growing very fast after the first cutting. On the 6th October three acres of *oats* were sown, half each of stout white and Tartarian, but the crop not promising to turn out well, was used as green fodder. Had the crop been put in at the end of August as intended the result would have been very different, but it was impossible to get it in then. This is to be regretted as an experiment with the local marl was being tried on this land. Two and a half acres of *dun peas* were sown about the middle of the month and give promse of a fair yield on the average, some portions being very good. Half an acre of *tick beans* planted about the same time gave excellent promise up to about the middle of December and then failed altogether, in fact almost died out. The next sowing of these will be made about April and good results should follow.

At the end of the month an acre of *Japanese millet* was put in and is doing remarkably well. Experiments as to the best quantities of both seed and manure to use are being carried out. An acre of *maize* was also put in about this time. Three varieties were tried, viz.:—White Horse Tooth, and Minnesota King, which are doing well, and North-Western Dent. This latter seems to be too susceptible to frost to do well here; in December it was blackened to the ground by a frost that only slightly affected the others. During the middle of November two more acres of maize were drilled in viz.:—Flat Red, Ninety Day and White Horse Tooth; all varieties are doing equally well.

During November half an acre of *cabbages* was planted out and although the plants had been badly eaten by the moth, they are coming away well and promise a favorable yield. Half an acre was tried in *root crops*. Swede turnip, half sugar Mangold and Yellow Globe were put in, half of each variety with stable manure and half with a dressing of superphosphate. At the time of writing those treated with animal manure are far in advance of the others.

Four acres of *potatoes* were planted during the latter half of November. Several varieties are being tried; they look remarkably well and promise to give a really heavy yield. Last season the most successful crop grown was that of potatoes. It gave a return slightly under four tons to the acre and from the appearance of the present crop this result should be nearly doubled. There have been many failures and partial successes on the farm and therefore it is very gratifying to have a crop, like the one referred to, that any visitor however critical cannot find fault with.

The crop of Algerian *oats* has been harvested and returned a ton and a half of hay to the acre. A strip of *wheat* sown at the same time also did remarkably well, being very clean and well headed. These crops were sown in June and last year in August, with practically the same return. It is hoped to get a far better result by sowing in April, which will be done this year.

GRASSES.—*Of the different grasses tried,* cocksfoot has done well, closely followed by prairie and Italian and English rye. All native grasses growing about the drains and headlands show remarkable luxuriance and it will be found that this new land will be eminently suited for grazing purposes. Of clovers, the cow grass, bird's foot and white all do well during the second season.

At the beginning of October some grass seeds received from the Transvaal were sown. Of five varieties tried only two germinated viz. Sweet Grass and Rhodes Grass, the former only fairly but the latter well. They have not, however, made a sufficient growth to say whether they will be quite a success.

GENERAL.—The *land* is fast coming into a better tilth. Last season it was impossible to cultivate any of the drilled crops, but now this can be done though not as cleanly as could be wished. A disc cultivator for two horses and another for single horse work have been added to the implements on the farm and they are transforming the ground rapidly.

Small fruits, vegetables and *flowers* are all flourishing and the *fruit trees,* especially apple, pear and plum, planted have made good and healthy wood.

Whitfield Farm.

Temple A. J. Smith, Manager.

RAINFALL.—The rainfall for the quarter was as follows:—October, 1.46; November, 3.31; and December, 2.91. Consequent on the satisfactory rainfall, the growth of crops and grass has been good.

CROPS.—Owing to the fact that drainage operations were not concluded until May, and clearing, fencing, and cultivation had to be accomplished after that date a lesser area was cropped than could have been desired. Being a stiff close clay, and very wet during the winter months, the land required an unusual amount of working.

Oats.—Eighteen acres of oats were sown for hay and the crop which has just been harvested has given a yield of about 30 cwt. per acre of nice quality stuff.

Maize.—Five acres of maize were planted early in November on the rising land, and are looking well; the height is from 4 to 5 ft. high and the colour is good. The varieties are Ninety Day and White Horse Tooth. Three acres have been planted on the flat, and this crop is also looking well.

Millets.—Four acres of Japanese millet and two acres of German millet were sown. Both plots were making good growth being from one to 2 ft. 6 in. high but were completely destroyed by grasshoppers, and the area has been reploughed and sown again with maize. The latter is just above ground and will make late summer feed.

New Zealand Flax.—A plot of Phormium Tenax has been put in and the plants (110) have set well.

Tobacco.—Three acres of tobacco have been transplanted and the crop is making fair progress. Great difficulty was experienced in getting the soil in proper condition for this crop owing to the limited time available for clearing, fencing, and working the land, which was ploughed once, harrowed six times, rolled and disced four times. A small plot of tobacco has also been put in on the high land and looks well. Plants have been grown and distributed.

CLEARING.—During the quarter the clearing of the 10-acre plot on the high land has been completed and 10 acres of the flat have been cleared for the plough; also 40 acres have been scrubbed, the saplings being grubbed out. The work was heavy owing to the size of the undergrowth. Care has been taken to reserve such trees as may be required for shelter. and these have been topped to induce thicker growth.

BUILDINGS, &c.—The dwelling was finished by the contractor on 22nd October and immediately occupied. Tobacco and milking sheds were finished previous to October.

Forty-five chains of fencing have been erected, consisting of posts and four wires. The farm is now divided into five paddocks.

THE NEW HOMESTEAD.

GENERAL.—Rabbits have been troublesome and burrows have been dug out and poison laid. Until the clearing is completed they cannot be thoroughly eradicated.

The open drains have been cleaned out and temporary dams made for stock watering purposes.

Tobacco leaf has been purchased and classed for the Franco-British Exhibition and arrangements made for the manufacture of locally grown leaf into Plug and Cigars for exhibition. Tobacco growers have been visited and the Tobacco Transplanter introduced to new districts.

Four men have been employed but owing to sickness a considerable amount of time has been lost. The cutting of the crop was done by contract. All other work on the farm is done by the four men mentioned.

The grasshopper plague has been very destructive, completely eating out the millet crops, and greatly damaging the grass. The Maize and Tobacco crops have also suffered, but will recover under suitable conditions.

STOCK.—The number of horses kept is four, viz.:—Three draught and one buggy horse. The cattle number fifteen, being mixed cows, steers, and heifers, taken in for agistment from the Rutherglen Viticultural College Farm.

The stock are looking well, and, excepting the horses, hand feeding has not been necessary.

INSECT PESTS IN FOREIGN LANDS.

(*Continued from page 79*).

FOURTH PROGRESS REPORT BY MR. W. W. FROGGATT, F.L.S.

R.M.S. *Morro Castle*,
Gulf of Mexico,
29th November, 1907.

I have the honour herewith to forward to you a progress report of my movements since I left Washington, D.C., on 15th October.

Accompanied by Dr. L. C. Howard, Chief of the Entomological Division, U.S. Department of Agriculture, I left Washington for New Orleans at 9 a.m., and passed through Virginia, North Carolina, South Carolina, and Alabama, reaching New Orleans at 10.30 p.m. on the 16th. After passing through Virginia, we came into tobacco and cotton country, the greater part of which, right into Texas, is sublet to the negroes who work it on the shares system. The landowner finds the land, mules, and seed, and pays the negroes' store bill till the crop is taken off, so always has his tenants in debt. A good crop is a bale to the acre, 500 lbs., worth at present about 5.5 dollars, or slightly over 10 cents a lb., but it has been down to 5 cents, which is the estimated cost of production. Roughly, 40 dollars an acre is a good harvest, which the landowner and tenant divide, so that after the cost of production is taken into account, the value per acre is not great. Where the cotton boll weevil (*Anthonomus grandis*) has spread, the yield over many thousand acres in the greater part of Texas and Western Louisiana has been reduced to half a bale an acre and it has only been the high price of cotton that has kept thousands of acres from going out of cultivation. The cotton seed is of some value for oil making, cattle food, and manure; it is hoped that the stalks may be used for the manufacture of paper, and experiments are being carried out to test this product. The halves system has led to very poor cultivation, and the tenant does not take any trouble to clear up the dead cotton plants after the crop is gathered, and so it is thus very difficult to deal with the boll weevil which is spreading northwards at the rate of 30 miles a year; it has crossed the Mississippi River, and is now at Baton Rouge.

At New Orleans Professor Hunter, who is in charge of the Agricultural Experiment Station at Dallas (Texas), met us, and we went on next day to the Agricultural Station at Baton Rouge, and the Pest Crop Commission of Louisiana Offices under the charge of Mr. Newell, where experiments dealing with the cattle tick, boll weevil, and other pests are being carried out. These laboratories are fitted out in a very elaborate style and there is a regular staff engaged under the State Government. The chief methods advocated in tick extermination are starving them out of each paddock by removing and smearing all stock, and thus gradually decreasing the infested area; dipping is discouraged. An introduced ant (*Iridomyrmex humilis*), allied to several of our species, which is said to have been introduced from Buenos Ayres, South America, is a very serious house-pest all over this State, and is spreading rapidly.

We left on the same day for Shrieveport, and arrived there at 10.30 p.m. Next morning we visited Mr. Hood's office, where experiments are

being carried on with parasites of the cotton boll weevil. We left the same morning for Dallas, and arrived there at 8.30 p.m. The next morning was spent at the Agricultural Station, where a staff of seven entomologists and field agents is working at the control of the weevil by mechanical methods, the discovery of parasites, or the production of a hardy, or early developing variety of cotton; 17,000 weevils were under observation at one time this year. I visited the Agricultural Show with Professor Hunter, and saw the prize stock, which included some very fine mules, but only about 20 sheep. Mixed cattle and "red hogs" predominated, though Berkshires were also well represented. I also visited the cotton mills, where an automatic draught sucks the cotton out of the carts and carries it into the store-rooms (Murrey's patent). In the evening I gave the staff an address on Economic Entomology in Australia.

On the 22nd we left for Houston, stopping at College Station where the Agricultural and Technical College of Texas is situated. It contains 600 students and a staff of about 50 masters and teachers, and is run somewhat upon the lines of the Hawkesbury Agricultural College, but technical work is also taught and there is a complete cotton mill with looms, iron work, &c. The students do all the washing and laundry work themselves; it was washing day when I went round with the President. This college is so popular that the rooms are all occupied, and over 60 students were camped in tents on the campus. The college is under State control, and has 800 acres of good land. We left at 4 o'clock, and reached Houston at 10 p.m. Next day we visited Galveston, and saw the Medical College, where such good work in dealing with mosquitoes was done during the yellow fever epidemic four years ago. Returning the same afternoon we left for Victoria, but stopped on the road at the invitation of the manager of the Pierce Ranch, one of the largest in the district, where they have introduced a number of different kinds of Bramah cattle from India, and crossed them with the large Texan cows. These bulls are very large, handsome, quiet animals, and the cross have also a very fine close hair. It is claimed that the bulls and their stock are tick proof. The suggestion is that the close short hair causes the larval ticks when they moult to drop off, as they have nothing to cling to. Rice, cotton, lucerne, &c., are also grown on this ranch, which consists of 70,000 acres of rich prairie country. We went on next morning to Victoria, where the Department of Agriculture has a small station, and after seeing the Officer-in-Charge, left for San Antonio, and arrived there the same evening. The following day was spent in arranging to go on to Mexico, and Professor Hunter returned to Dallas, and Dr. Howard to Washington.

On the 26th October I left for Mexico City, *via* Laredo, the border town, reaching my destination at 6 a.m. on the 28th. Here my friend, Mr. A. Koebele, the well-known Californian Entomologist, met me, and with him I made my head-quarters at the Itiburdie Hotel. In Mexico I placed myself in the hands of the Department of Fomento (Department for the Promotion of Information). Professor Herrera, Chief of the Entomological Branch, was away sick, and there were three "Festa days" coming together at the end of the month, so nothing could be done in the field for three days. The Secretary introduced me to Dr. Giandra, next in charge, who engaged an interpreter, and arranged for me to go down to the town of Yutapec in the Mirelas country, the chief centre of the orange industry. I spent the rest of the time in learning about the raw products of the country, visiting the native fruit markets, and, under

Mr. Koebele's guidance, the districts round the city where there are many small native orchards, which are badly cultivated, and in a very neglected state. One of the chief industries in fruit is growing strawberries for the city restaurants. On the road to Tres Marias, I visited the Agricultural Show, where there was a very fine exhibit of cattle, chiefly Holland and Swiss, but a consignment of Herefords brought over from California was sold by auction and brought very poor prices. All the horses were English, imported or bred from English stock, and were very fine animals: poultry was very well represented, so were pigeons and rabbits. Sheep, as usual, were poor, and represented by only two pens of Cotswold.

On the 5th November I left for Yutapec at 7 a.m., arriving there at 3 p.m. The Mayor, his Secretary, the Chief of Police, Chief Fruit Inspector, and a mounted escort met me, and took me to a house, where I lived with a bodyguard of a policeman and a soldier during my stay. The orchards of Yutapec consist chiefly of oranges; the valley is rich black soil, and is all under irrigation. All the trees are seedlings, and of considerable size, and grown in a very irregular manner. The growers know nothing about pruning, grafting, or budding, and apparently never cut out a diseased tree until it dies out or is blown down, but the ground is so rich and the climate semi-tropical that they nearly always have a crop of fruit. The fruit is large and well flavoured, and contains few seeds. This district is the only one where oranges are grown for export, and the Entomological Division has advised the State officials who have passed laws to compel the growers to clean up their orchards by burning or burying the infested fruit and windfalls. The expense of making the furnaces, inspecting the fruit, destroying the old wooden fences, and replacing them with barbed wire, and the payment of the inspectors' salaries is borne by the Federal Commission. The State authorities see that the regulations are carried out, even to arresting a man who will not clean up his orchard, or notify the inspectors when he is going to gather his fruit. Any fruit arriving at the railway station without an inspector's certificate is not allowed to go on the train, and the owner has to get an inspector to examine it there. Where wood is scarce all the oranges are gathered into heaps, and an inspector punches a hole into the end of each orange, and the next one injects benzine with a glass syringe, plugging up the hole with some clay. I saw two men treat 358 oranges in 40 minutes; it is claimed that the benzine kills every maggot, and these oranges are then allowed to rot on the ground. Even if cheaper than burning, I doubt if this treatment kills all the maggots Labour, however, is cheap, the Chief Inspector gets 75 cents (1s. 6d.), and the assistant 50 cents (1s.) for twelve hours work. The oranges are examined while being placed in the crates, and the inspectors are very expert in detecting damaged fruit. They are counted in threes, two hands of three, or fifty-three hands, 318 oranges, to a crate. The oranges are worth 25 cents (6d.) a hundred in the orchard; the crates are carried to the railway on mules. The wild oranges, which are sour and are made into wine, are gathered and sold for 3 cents (1d.) per hundred.

Most of the orchards are small, ranging from 50 to 500 trees in this district and other parts of Central Mexico, but larger orchards, more on American plans, are now being planted in the north. The Department, which naturally wishes to keep the export market in the United States open, claims that it is only in this State that the fruit fly is found attacking oranges. I have, however, records that it is found in other districts, and it probably has an extended range, but the methods that are enforced

in Mirelas State are greatly reducing the pest. I could not find that the parasite on the orange maggot, recorded from Mexico, was of any value in checking the pest.

On returning to Mexico City I made several visits to different districts, and spent several days at the Department with Professor Herrera obtaining information regarding the pests of agriculture which I have recorded for my report, but will not enlarge upon here. Acting on the advice of Professor Herrera, and armed with credentials from him to the Jefe Political or Chief Magistrate of the different districts, I left Mexico City on the 15th for Puebla, reaching there late in the afternoon. I engaged an interpreter, and visited the Governor's Secretary, who gave me letters to the President of the University of State, where there was a small collection of Mexican insects. With a letter to the Mayor of Tehuacan, I left at 6 a.m. on Sunday morning for that town, where I met two of the chief ranch owners, and went with them to the fruit market. Here I was told that a white grub often destroys a great deal of the maize by gnawing off the roots. Maize, barley and fruit are the chief crops grown by irrigation, but hardly anything is exported.

On the 18th I left Puebla for Orizaba, and reached that town the same afternoon. I obtained an interpreter and called upon the Judge of the district, who gave me letters to the managers of the two large plantations in the neighbourhood, San Antonio and Galapella, which I visited next morning, going through the orange orchards which were free from scale and fruit fly, but badly infested wth melanose. As the oranges are not used for sale, the orchards are much neglected. I drove through coffee plantations and sugar cane, and visited the mill, which is a very primitive affair with one pair of rollers. The sugar is all made up into loaves, the loaf sugar of three grades; a large amount of raw spirit is also manufactured. In another orchard visited I noticed a very curious mandarin orange tree with short sessile leaves almost like holly.

On the 20th I left for Vera Cruz, passing through large tracts of coffee (grown under shade trees) and banana plantations between Orizaba and Cordoba. On ariving at Vera Cruz the same afternoon I found an interpreter and called upon the Chief Magistrate, who advised me to go down to the tropical country of the Isthmus, and offered to give me a letter to his brother, the owner of a large ranch and plantation; this I accepted. Finding there was a boat going down the coast to Coatzacoalcos, I made my arrangements to leave, and though the boat was advertised to leave early in the day, did not get away till dark. After a smooth passage of about 100 miles we arrived at the mouth of the river at midday, where I found an Indian with a canoe, and engaged him to row me up to Signor Ignacio Velo's, about six miles up a lagoon, and arrived there that evening. Here I spent two very interesting days; the estate consists of 6,000 acres of rich tropical land, growing vanilla, coffee, and oranges. Signor Velo also supplies the town with milk, and on the swampy land grows coral grass, which he cuts and sells in bundles for the town horses. He has 500 cocoanut trees, and is planting out more. His cattle are chiefly of the Mexican type, but he is a very enterprising man, and has imported four fine Holstein bulls from California. On the Monday morning I left Coatzacoalcos for San Lucrecia, the junction of the train from Vera Cruz and Salona Cruz on the Pacific coast. Here I had to remain until 5 o'clock next morning, when I took train to Vera Cruz, and arrived there that night. The following day I packed up and took my passage in this boat for Cuba and Jamaica, leaving at 6 o'clock yesterday.

DESCRIPTION OF APPLE.

James Lang, Harcourt.

Stone Pippin.

Fruit above medium size, three to four inches wide at the base, and three inches high tapering towards the apex; fruit regular and even in its outline. Eye small and closed, set in a wide deep plaited basin; stalk short, inserted in a wide deep cavity, the base being strewed with patches of russet. Skin greenish yellow on the shaded side and sometimes flushed with red on the side next the sun; flesh white with a green tinge, and very hard and firm. Keeps in condition a long time—in season from April till November. The tree is a very strong upright grower and crops well; leaves light green above and crinkled showing the underside of the leaf which is very downy—the foliage is quite distinct from all other apples.

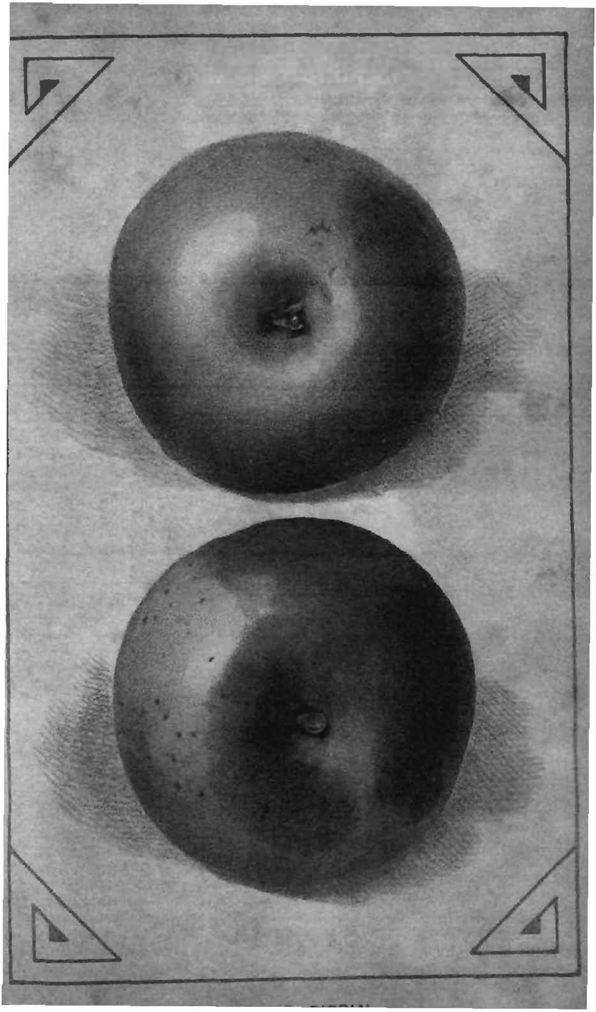
This variety is probably an Australian Seedling, no mention of it being made of it in "Hogg" or "Downing."

BREEDING FOR THE DAIRY.

J. S. McFadzean, Dairy Supervisor.

Apart from the hygienic control of the conditions under which dairying is carried on, perhaps the principal object of the Milk and Dairy Supervision Act is to assist towards an increase of the output of dairy-produce in the State, by giving all farmers who require it information and personal instruction regarding the feeding and breeding of their stock. In carrying out the supervision work a very common question for a supervisor to be asked is—"What is the best breed of cattle for the dairyman"? This inquiry often comes from the owner of a mongrel herd, who, seeing his cattle as they are "being seen," is possessed of a sudden desire to improve; but there are also many beginners each year who are seeking information on this subject to the end that, by starting on right lines, they may the sooner have their business established on a paying basis. The answer usually given in print to this question is that there is no "best breed," meaning that there is no breed of cattle which will prove the most profitable under all variations of local, seasonal or climatic conditions. This, while correct, is still an incomplete answer; and requires for its further elucidation that the principal qualifications possessed by the various breeds should be considered.

Taking the pure-bred stock of this State in their relative bearing to the dairying industry only three breeds are numerically strong enough to be commented on; viz., the Jersey, the Ayrshire, and the Milking Shorthorn. Each of these is spoken of by stockmen as possessing what are known as "breed characteristics" that are supposed to render it especially adapted for some particular branch of dairying; but it is not at all uncommon to altogether overlook the very decided influence that environment has on all animals. The claims made by the admirers of the Milking Shorthorn are based on its being a "general-purpose" cow; because, in addition to being a producer of a large quantity of milk of



a fair quality, its size and quality of flesh permit of it being profitably fattened for beef when of no further use as a dairy-cow. The Ayrshire has the reputation of being the heaviest milk producer for its size, butter fat not considered; and the Jersey is acknowledged to be the ideal cow for richness of milk. Something of the same rough description of the principal breeds of sheep might also be put forward, but it would be a rare thing to see an intending sheep-farmer go into a market and purchase a flock on the strength of it. Such a proceeding would mean that feeding—the basis of all animal management—had been lost sight of; and the fundamental principles of feeding are embodied in the situation, water supply, and fertility of the farm on which it is intended to place the purchased stock.

A certain amount of comparison between these two branches of agriculture—sheep and dairy-farming—might not be out of place here; though the former is now an old established industry with us, and the latter but of comparatively recent development. The intending sheep farmer, as a rule, will not only make full inquiries as to what class of sheep is most suited both to his district and his requirements but he will usually make the acquaintance of those keeping such stock in the locality, and thereby post himself in all available particulars before making his purchase. He then looks for, and usually succeeds in buying the required number in one line so as to have them as even in size, breed, and general quality as possible; and if they are breeding ewes they are sure to be mated to pure bred rams. This latter point is literally forced on him; for long experience has so fully demonstrated the practical necessity of pure bred rams that there is now absolutely no demand for anything else, and so none are raised. Also, the ram is invariably the highest priced animal in the flock. On the other hand a dairyman is very often too conservative to ask advice from his neighbours, and little inclined to communicate his intentions to them, apparently regarding them in some way as competitors. Rightly or wrongly he may have his mind made up as to what is the best cow for his purpose; but, at the market, unless he is fortunate in buying at his own price it is more than likely he will purchase those that accord more with his ideas of value than of type; and often all he has to show for his skill in buying is a certain number of mixed cows of unknown working capability. Not infrequently a big cross-bred bull will be purchased at "sausage-meat" price to mate with them, when a few pounds more would have bought a pure-bred animal; and the buyer finds excuse for himself in the possibility of the cross-bred bull's calves making the better vealers. The result of such a purchase is not hard to foresee. An uneven lot of cows means uneven and therefore unsatisfactory returns; and in many cases the buyer would have done wisely to have come away without cows rather than invest in animals that were not up to his standard. Such cases are of daily occurrence. With an ideal type before him the farmer should buy only in accordance with that type, even if he is thus compelled to attend many sales before his herd is complete. Time spent thus will prove to be time and money saved. If he fails to buy well at first he will be compelled to cull heavier later on; for evenness in the herd is an absolute necessity if a full measure of success is to be achieved.

Only too frequently do we see herds that bear out the foregoing assumption that, if the owner has any knowledge of cows he must have

forgotten to use it; and not five per cent. of these owners can give any reliable statement as to the relative value of each animal from a dairying stand-point. Yet people expect to make dairying pay by such unbusiness-like methods as these. Australia's wool trade was not so built. Such dairymen say "they have no time" and "it does not pay" to weigh and test their milk so as to closely cull their cows. They have never given a thought to the work that sheep-breeders have done and are still doing in the improving of their flocks. There are many stations and farms where the principal work is the breeding of stud sheep for sale; and a far larger number where the improvement of the weight and quality of the annual wool clip is the perpetual consideration. On all these the stud animals are marked and numbered, and particulars of their breeding recorded. They are hand-classed as they grow, and the quality and staple of the wool on the various parts of the animal noted, and they are culled out or kept accordingly. At shearing time their fleeces are weighed and classed; and the mating of the ewes and rams is done only after due consideration of the quality of each, and its chances of producing something better than itself. When culls are marketed they are classed into as even looking lots as possible by both breeders and auctioneers; and, in consequence of this general demand for uniformity, sheep-breeding is always on the up grade; with the satisfactory result that Australia's wool sales attract the world's buyers. Any one who is sufficiently interested to glance at the flocks that are met with on the various farms of the State cannot but be struck by the evenness of size and type apparent in each and he may thus be assisted towards realizing the work that the sheep-breeders have done; but let him turn to our dairy herds, and ninety per cent. of them will prove to be a mixture of every breed in the district, including even those which have no claim to possessing dairy qualities.

To establish comparative evenness of type in his cattle should be one of the first steps taken by every stock-keeper, and this can only be effected by systematic buying, and the use of pure-bred bulls. Unless circumstances such as are referred to later on should direct otherwise, the choice of a bull by the dairyman should be made in conformity with whatever milking breed his cows show most relation to, and from a herd where the stock have been carefully bred for dairy work for some years. This choice should be made with great care; for it may mean much loss of time if it should prove necessary to alter it afterwards. After being used for about 2½ years, the bull should be replaced with another of the same breeding, so that the line of milking blood introduced may be continued with uniformity. As the weighing and testing of the milk will have demonstrated which are the worst producers among the old stock, these can be culled out and replaced by the heifers of improved breeding as they come in; and with a continuation of this method the herd will thus be graded up both in appearance and production at the same time.

Another matter to be commented on is that very few dairy-farmers treat their business with the same general attention to detail as do those who engage in other industries. On many farms most of the milking and general dairy work is done by the women-folk or children; and in consequence, if there should be but a small return from that branch less notice is taken of it than if the work were done altogether by the men. But even under these conditions it is equally important that as much as

possible should be got out of each cow in return for labour and feed. If this labour had to be hired, or feed purchased for the cows, in many instances the dairying could not be carried on by reason of the number of useless animals each herd contains; but where these expenses have not to be met by a direct cash outlay the question of profit is not so forcibly presented, and is apt to be altogether overlooked.

Too much attention cannot be given to the fact that 6 quarts of milk daily, or 4 lbs. of butter weekly, is the lowest average return that a dairy-farmer can afford to handle his cows for. Animals that do not reach this average for their period of production should be disposed of, and replaced as soon as possible with something more profitable. It should be the aim of every dairyman to keep his cows in milk at least nine months of the year; and the sooner the above return is established as the minimum basis in each herd the sooner will every herd be in a fair way to become a reliable source of profit. The fact that some farmers have found it possible to make even a small profit by the haphazard methods they have practised in the past may be taken as significant of what may be expected by them if their work is carried on systematically.

Returning to the subject of breeds, the Milking Shorthorn under favorable conditions stands as being all its supporters claim for it. There are many authenticated records proving its capabilities both as a milk and butter producer, and its appearance is a good guarantee to its fattening qualities. There is however a matter which is too often overlooked in studying dairy returns; that is, the amount of food consumed by each cow. A large return of produce does not necessarily mean a large profit. Profit from a dairy cow is usually considered to be the amount by which the value of the produce from the animal during a stated period exceeds the cost of production as represented by the food it has consumed. A large cow requires as a rule more food to sustain its body than does a small one; and therefore consumes more in proportion to the quantity of milk she gives. This is a very important item where any considerable amount of food has to be bought for the cows yearly; and it must also be reckoned with more or less under all conditions. Also, as a certain amount of labour has to be expended with every dairy herd in milking and general work it is customary to eliminate this matter of labour from the estimate; but this proceeding is questionable. Where the work of the herd includes any housing or hand feeding, the extra room required or weight of food carried per cow, as well as the amount of capital invested and annual turnover, are items which must be included when determining the relative values of large and small dairy cows. Where suitable food can be provided at low cost and the question of room does not occur, the "general purpose" cow is undoubtedly worth considering; but where housing and hand feeding are necessary big cows have little chance of successfully competing with the smaller framed milking breeds.

The Ayrshire occupies a somewhat intermediate position between the more bulky Shorthorn and the neatly-proportioned Jersey. Its clean bright colour and alert appearance assist towards its popularity. It has been bred principally for a heavy milk yield; but its various qualities are more or less pronounced according to the attention that has been paid to them by the breeders of the several strains. It is of a medium size and a strong constitution, is a class of cow that readily adapts itself to most situations and conditions, and its fanciers are to be found extolling its qualities side by side with both Shorthorn and Jersey breeders.

The Jersey is recognised the world over as standing unequalled as a breed for the profitable production of butter; and latter-day competitions have proved that its breeders have also some right to claim for it the same pre-eminent position as regards its milk yield. It is the smallest of the three breeds mentioned, is extremely docile, a good forager, and a heavy continuous producer of the best quality of milk.

Bearing the foregoing facts in mind when considering the improvement of such milking stock as are usually found on small farms where the separator is used, and also on larger areas where the amount of sown pasture land is proportionately small, there appears no quicker, cheaper, or surer method to use in conjunction with culling than the introduction of Jersey bulls. Without both large acreage and good pasture there is little chance of a dairyman making a success of two branches of cattle raising; so his efforts had better be concentrated towards that which is most suited to his conditions, viz.—the production of rich milk. Where large framed cattle have been in vogue previously, the objections usually raised by farmers to the introduction of Jersey blood are embraced in two distinct and, to them, conclusive points. The first is the assumption that the breed will not stand cold weather; and the other is that the bull calves so bred will not make into saleable steers.

The first charge is usually based on the fact that unless a Jersey cow in milk is either rugged or provided with shelter in cold weather she is apt to fall off in condition. But a falling off in condition does not necessarily mean a falling off in her milk supply. To the dairyman who weighs and records the milk from each cow this peculiarity is easily accounted for, as it is one of the chief characteristics of the Jersey cattle that they are more disposed to uphold their milk yield under variations of the weather than to retain their condition at its expense. On this account the admirers of the breed claim for it the title of "the honest Jersey"; inasmuch as, though other cattle may by lessening their milk yield retain their condition, the Jersey can nearly always be depended on to give full return at the pail for all food supplied. The farmer who does not regularly weigh the milk from each of his cows is seldom aware of this, for he has nothing but his memory to guide him, and memory can hardly be relied on to this extent. The Jersey breed has reached its highest state of excellence in England and the United States of America, both of which countries are subject to much greater extremes of temperature than Australia; and where, if there existed any constitutional weakness in the breed, it would soon be brought to light. There, as here, however the result has been the opposite; and the Jersey has far more supporters now among dairymen than ever. Denmark is looked on as the head-quarters of practical dairying in Europe, and there the Jersey is in high favour. The largest dairy contest of recent years was that held at the St. Louis (U.S.A.) Exposition from 16th June to 13th October, 1904, when 45 cows competed for the prize offered for "the economic production of butter-fat," and 74 cows for the prize for "the economic production of milk," during the 120 days test. Both prizes were won by a Jersey; and the 25 Jersey cows competing were far before all others with an average of £8 4s. 8d. per cow profit for butter produced during the 120 days. The winning cow gave during that period 580 gallons of milk containing 280 lbs. of butter fat; and the average for the 25 Jerseys was roughly 498 gallons of milk, yielding 230 lbs. of butter-fat per cow. This is a big average, but the figures are from

the official records and are beyond question. The winner was 70 days in milk when the test began; and in her last 7 days she gave 32 gallons of milk containing 17.3 lbs. of butter fat.

Coming closer to home we find the Jersey blood very prominent in the herds of many of the suburban dairymen, particularly in the southern suburbs where cold winter winds are prevalent. The grazing areas there are limited, and it is compulsory with the dairymen to have cows that will produce the largest quantity of good quality milk at least cost; and the Jersey is their choice. In any country or climate where dairying is carried on under profitable and scientific conditions this breed is in evidence; and when any competition is held to test the quality of the dairy stock, the Jerseys can always be depended on to make a good showing, if they are not in every instance the actual winners. That they also consume comparatively much less food than other cattle for the quantity of milk produced was also conclusively proved by the St. Louis competition,—the 25 Jerseys there being superior to 28 of the next best competing cows in this advantage.

The fact that the Jersey has been continuously bred for butter and milk production for considerably over a century is the cause of the wonderful prepotency which the bulls show in implanting the dairying qualities of the breed in their offspring when used in crossing; and each succeeding cross of this blood that raises the grade of their stock nearer to the pure Jersey usually shows improvement in the desired direction.

As to the size of the steers being against the use of the breed on a dairy farm, this is only a loss in imagination. Very few dairy-farmers who raise their own stock can afford to waste grazing room in raising steers. There has been many a steer sold from a farm at a good price that would have paid still better if it had never been raised; for its food and room could have been put to better use. A well grown 3 year old springer of a good milking strain is worth more to the dairyman than any steer of the same age; and if proper care is given it will return him a yearly profit to the same value for several seasons afterwards. All such calves as the small dairy-farmer does not require to raise for future milking or breeding purposes he will most profitably dispose of by selling for whatever they will bring as small vealers at from five to eight weeks old. The producer of milk and butter should leave the raising of beef to those who have the combined acreage and natural pasture for the purpose. Besides this actual gain in growing milkers in place of beef there is therefore a very significant saving effected each year in hand feeding by the farmer who has the smaller framed cows; for dairy cattle must be so fed for some portion of each year if they are to be kept up to their full limit of production; and, if to this saving is added the very feasible probability of the Jersey cow giving a better percentage of butter fat the year through than a coarser animal, she will have sufficient in her favour to warrant her owner spending the price of a rug on her many times over.

As previously suggested, this advocacy of the Jersey is not intended to apply to the fortunate dairyman who has built up a line of large framed milkers, and has both the extent and quality of grazing area to profitably carry them; but, where acreage is limited, and any lengthy term of hand feeding is necessary throughout the year, the Jersey is without a doubt "the dairyman's cow."

DISEASES OF FARM ANIMALS.

(*Continued from page 63.*)

S. S. Cameron, M.R.C.V.S., Chief Veterinary Officer.

VII.—ACCIDENTS AND INJURIES.

FRACTURES—*continued.*

BROKEN ARM.—Fracture of the bone of the arm (the humerus) is fairly common in horses (see Fig. 3) while fracture of the fore arm (the radius and ulna) occurs most frequently in cows and the appearance presented by the bones in the accompanying illustration (Figs. 10 and 11) is not uncommonly met with in cattle practice. The illustration is from a specimen kindly lent by Mr. W. A. N. Robertson, G.M.V.C., assistant veterinary officer, Department of Agriculture.

Fig. 10. Broken fore arm bones (radius and ulna) showing attempt at union in displaced position, rendering the limb short.

Fig. 11. Broken fore arm bones (radius and ulna) as in Fig. 10, but placed in the proper position for effective union.

SPLIT PASTERN.—This has already in part been dealt with in the Chapter on Lameness (see page 371). It often occurs without any apparently adequate cause. A false step when galloping on hard ground or over crab-holey country or when turning a sharp bend is a frequent cause. It is usually the long pastern bone that is concerned and the fracture is most often a perpendicular one. As a rule split pastern is not a very serious affair. The part needs to be stiffly bandaged and kept completely at rest. With such treatment in ordinary cases recovery may be expected in three weeks or a month.

BROKEN PELVIS.—The pelvic bones may sustain fracture at almost any part as a result of a fall or violent blow. The most frequent situations of pelvic fractures are shown in the accompanying sketch (Fig. 17). The most

serious form is when the fracture involves the socket of hip joint (the cotyloid cavity or acetabulum). In this case there is great lameness and it is practically permanent, for, in the process of union bone is deposited around and within the joint, which is thereby rendered permanently stiff.

When fracture of the pelvis is suspected but not confirmed by external manipulation an internal examination should be made by introducing the arm into the rectum, when most likely crackling movement (crepitation) of the fractured bones, or at all events swelling and heat at the seat of fracture may be felt.

Fig. 12. Split pastern—transverse and longitudinal fracture.

Fig. 13. Double fracture of head of long pastern bone.

Fig. 14. Latero-longitudinal fracture of long pastern bone.

Fig. 15. Split pastern, side fracture.

Fig. 16. Split pastern, fracture repaired.

DROPPED HIP.—This is a condition in which the point of the hip (the anterior spine of the ilium) is broken off. It usually results from a blow such as may be sustained by contact with a door post when the animal is rushing into the stable. It is seldom accompanied by serious lameness but the muscles of the quarter may become wasted for a time, usually the fracture unites without trouble or treatment of any kind. Sometimes however a false joint is formed and the broken prominence is always moveable. *In all cases the displacement remains, i.e., the point of the hip is*

permanently "dropped." This is because of muscular action pulling down the broken bone and preventing it resuming its natural position (see Fig. 18.)

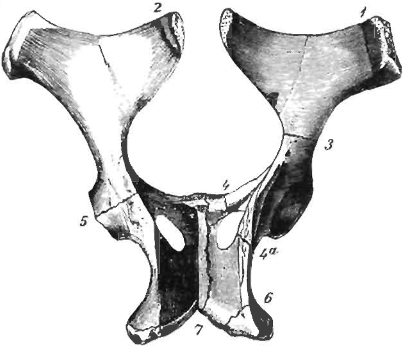


Fig. 17. Pelvis bone of horse, showing most frequent seats of fracture.—1. Fracture of point of hip (anterior spine of ilium) or "dropped hip." 2. Fracture of croup bone (posterior spine of ilium). 3. Fracture of shaft of ilium or "broken hip bone." 4. Fracture of pubis bone. 4A. Fracture of shaft of *ischium bone.* 5. "*Broken hip joint*" *or fracture into socket of hip joint (acetabulum).* 6. Fracture of point of rump bone (*ischium*)—"Broken rump" or "Flat rump." 7. Longitudinal fracture of floor of pelvis. (After Dollar.)

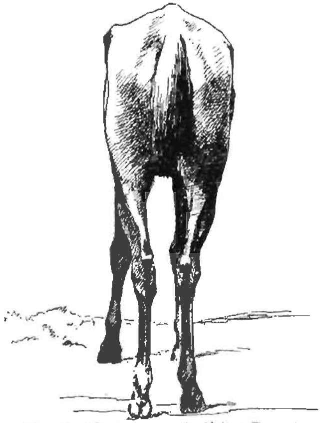


Fig. 18. "Dropped hip." (After Hayes.)

FRACTURE OF THE PATELLA OR STIFLE-CAP.—This is often brought about in the same way as dropped hip. In Australia it is also of common occurrence in steeplechase horses and hunters because of the stiff unyielding nature of the orthodox "post-and-rail" fences they are called upon to jump. Frequently when a bold jumper is tiring he is apt to drag his hindquarters over the top rail, and in doing so, especially if there is much pace on, the violence with which the stifles strike the top rail is sufficient to cause fracture of the patella. The fracture is usually a longitudinal one and in some cases recovery takes place without a permanent injury to the joint. Such a fracture is eminently one in which a blister should be made to take the place of splints and bandages—bandaging of the part being an impossibility. The foot on the fractured side should be shod with a "patten" shoe—one with a high toe piece and heels so that by the raising of the limb the stifle joint may be relaxed.

BROKEN LEG.—Strictly speaking by the term "broken leg" a fracture of the bone between the stifle and hock joints (the tibia bone) is meant. This bone on its inner aspect lies bare underneath the skin, unprotected by muscular or other covering, and it is consequently very liable to be fractured by the kicks of other horses. Of 1,082 fractures occurring during four years amongst horses in the British Army 189 (or 17½ per cent.) were fractures of the tibia. As previously mentioned the fracture often occurs without displacement on account of the strong character of the fibrous covering (periosteum). In such cases there will be slight lameness and a limited swelling may appear in a few days (the provisional callus). Perfect rest should be enjoined and the horse should not be allowed to lie down as displacement is apt to occur when strain is put on the bone in rising.

Fractured tibia with displacement is a very grave affair it being almost impossible to keep the fractured bones at rest on account of muscular action, the fact that the parts have no muscular or other support, and the weight of the limb below.

The tibia is the most common seat of "green-stick" fracture, the bone being fractured half way through at the point where the blow is received and then split from this cross fracture in an upward and downward direction (see Fig. 2, page 58). With care in the direction of preventing jerky strain on the bone for a few weeks this variety of fracture heals without much trouble.

DISLOCATIONS.

A *dislocation* is an unnatural and persisting displacement of the bones or parts of bones entering into the formation of a joint, as distinguished from a *luxation*, which is a partial displacement which is not persistent—one in which the bones slip back into their natural position at some part of the movement of the joint. These conditions are very rare in animals. In horses the most common forms are:—Dislocation of the patella, dislocation of the shoulder joint and knuckling over at the fetlock. These conditions have already been dealt with in the Chapter on Lameness (see pages 218, 369, and 470). The dislocation of the hip joint in cattle known as "spaldering" has also been mentioned (page 470).

Dislocation of the trapezium bone of the knee and of the sesamoid bones behind the fetlock has been met with rather frequently amongst racehorses during recent years by Mr. S. O. Wood, V.S., of Caulfield. The condition is a serious one, and although subject of cure with proper treatment by bandaging, it is seldom that recovery is sufficiently perfect as

Greyhounds are prone to dislocations of the small bones of the knee and feet. The injury is sustained while turning suddenly in "wrenching" the hare or when racing on hard uneven or stony ground. The dislocation is very easily set right but it is apt to recur, as indeed are all dislocations, because of the fact that the binding ligaments of the joint are generally sprained and, as explained elsewhere (page 262) ligaments so affected become elongated and are therefore less capable of maintaining the bones in proper position.

SPRAINS.

Some confusion exists as to the terms "sprain" and "strain." They are often used synonymously but the difference will be understood when it is explained that a strain is the act of stretching or over-exertion by which a sprain is produced. The one is the cause, the other the effect. A sprain may be defined as an injury of a muscle, tendon, ligament, or other stretchable structure resulting from excessive straining, pulling or twisting whereby its fibres become over-stretched, disarranged or ruptured.

The sprains of defined character to which the horse is liable have been givn detailed attention in the Chapter on Lameness (see pages 219, 259 to 264, 369, and 468, 469), and their treatment has also been indicated at the same place (pages 220, 259, 264, 370, 468, 469).

WOUNDS.

Wounds vary in gravity according to (a) their size and situation (b) the tissue wounded and (c) their shape and the manner of their infliction.

Large wounds are not necessarily the worst, indeed a small punctured wound is often, it may almost be said always, a source of greater trouble than a large open wound, but other things being equal the larger the wound the more serious it is and the greater the length of time which will be occupied in its repair and treatment. Wounds in the vicinity of joints are usually serious not only on account of the danger of extension into the joint but also because the motion of the joint hinders repair; in fact the greater the movement to which the surfaces of the wound are subjected the greater are the difficulties of successful treatment.

Flesh wounds are infinitely less serious than those in which tendons, ligaments, bones or large blood vessels are involved, and, within limits, the richer the blood supply of a part the quicker will healing proceed.

Varieties of Wounds.

According to shape and manner of infliction, wounds are classified into three kinds—incised wounds, punctured wounds, and lacerated wounds.

INCISED WOUNDS are those made with a clean-cutting agent such as a knife, glass, sharp stones or iron and the like. Their depth may vary but the opening is usually larger than the cavity. Beyond the general treatment given below, the special treatment required for this class of wound is that severed surfaces should be brought together evenly and maintained in that position. According to the part affected this may be done by stitches or sutures (page 71, Vol. V.) or by the use of plasters or by the application of pressure by means of bandages. In wounds on the limbs the use of bandages, even after stitching, is often beneficial, as by their aid better apposition of the wound surfaces is maintained and the strain on the stitches is lessened.

PUNCTURED WOUNDS are those "produced by the penetration of a sharp or blunt pointed instrument usually to a depth disproportionate to the aperture of entrance" (Williams). They are much more serious than incised wounds for the main reason that any discharge is likely to be imprisoned, and, germs having been introduced at the time of infliction

of the wound, the formation of matter (pus) is encouraged and often proceeds to the extent of abscess formation, or burrowing into surrounding tissues. If the discharges are of a toxic character they are liable to be absorbed and produce some form of blood poisoning (septicæmia) or, as when the *Tetanus* (lockjaw) germ has been introduced, some specific disease. The untoward conditions instanced are more likely to occur when the puncture is in a downward direction because the wound fluids then receive no assistance from gravity in discharging. In such cases it is necessary to enlarge the external wound by a downward stroke of the knife for such a distance and in such a direction as will allow the outflow of any discharge. Gun-shot or bullet wounds may be classed as punctured wounds and they require the same treatment.

LACERATED WOUNDS.—A good example of this type of wound is seen in "broken knees." The edges and surfaces of the wound are torn and bruised, and present a ragged or shredded appearance. Such wounds are most often "dirty" and almost always result in pus formation.

The Healing of Wounds.

Simple clean cut wounds may heal by either of the processes "immediate union" or "primary adhesion." The former occurs when the bleeding is slight and the cut surfaces are brought into exact apposition. The severed ends of the blood vessels unite and the blood flow through them is re-established. Minor surface cuts on a man's hand often heal in this way but wounds in the lower animals are seldom, if ever, so healed. In primary adhesion the wound surfaces become gummed over with an exudate of lymph from the small blood vessels of the cut tissues. Adhesion of the surfaces is thus produced and maintained until new cells are formed by which permanent union is effected. This method of healing is also rare in animals.

The most common method of healing is by the process known as "granulation." In this process there is growth of new tissue called scar tissue which forms by cell-proliferation and which ultimately becomes organised or permeated with blood vessels and nerves. This scar tissue is at first soft, tender and easily bled and is called granulation tissue. In the case of a gaping wound it gradually fills up the wound from the bottom to the surface level. At times the growth may extend so as to stand out beyond the lips of the wound and produce the condition known as "proud flesh." In a wound in which the cut surfaces are opposed to each other the two layers of granulation tissue come together and unite by mutual pressure and the formation of blood vessels. The new scar tissue on the surface of a healing wound gradually hardens and acts as a false cuticle forming a "scar" or "cicatrix." It is a peculiar property of scar tissue that for a lengthened period it undergoes contraction, and so scars gradually lessen and in the case of small wounds become practically obliterated in time.

HEALING UNDER A SCAB is perhaps the most salutary method of healing, the scab preventing the introduction of germs, dirt, and other foreign matter and forming a natural protection against cold, wet and other adverse external influences. The scab is formed by the drying of the gummy fluids (lymph) and blood and pus which ooze from the wound surfaces and, except disturbed by violence, it usually remains attached until the citatrix is sufficiently hardened to withstand exposure.

Treatment of Wounds.

The *sine qua non* in the treatment of all wounds, and especially of severe wounds, whether they be incised, punctured, lacerated, or bruised,

is that they should be kept clean. If this is not done, a surface is afforded for the lodgment and multiplication of atmospheric and putrefactive germs, which by their multiplication and destructive action cause an unhealthiness of the raw surfaces, and a more or less complete stoppage of the healing process. To prevent this, it is advisable that the wound in the first instance should be gently sponged with lukewarm water, in which is dissolved a little carbolic acid (a tablespoonful of acid to a pint of water), to remove the dirt and blood clots, and afterwards anti-septic lotions or powders, should be applied once or twice a day.

It is important to prevent "pocketing" of any discharge there may be. This is always apt to occur when the wound runs in a downward direction, and allows the matter or discharge to gravitate and become imprisoned. If the discharge is at all unhealthy or has an offensive smell, and is not allowed to drain away, it permeates the surrounding tissues, and so causes mortification or spreading gangrene, or it may become absorbed into the blood stream, causing blood poisoning (septicæmia), in either of which cases death speedily results. This "pocketing" most commonly occurs in punctured and lacerated wounds, and it is always necessary, provided the discharge is at all excessive, to give the matter vent, either by making an independent opening on a level with or below the bottom of the wound, or by increasing the external opening of the wound sufficiently in a downward direction to allow the discharge to drain away.

All dressings for wounds should be of an antiseptic nature, and free from irritating properties. Dry dressings are by far the best, the advantage being that they form a protective covering for the wound, and so simulate the best form of healing—under a scab; but if a wound is deep, it will be necessary to use a liquid dressing and a syringe (pewter or glass) to force it to the bottom.

WOUND LOTIONS.—A solution of pure carbolic acid (one part to 20 or 40 of water according to the foulness of the wound) forms a simple, and one of the best anti-septic lotions. Similar strength solutions of creolin, lysol, and eucalyptene are equally good and they have the added advantage of blending well with the fluids of the wound. Boracic acid (1 in 20 of water) is an effective and non-irritant antiseptic for tender surfaces or tissues. Carbolic oil, once so largely used, is not so good as an antiseptic but on account of its adhesiveness it forms a good protective covering for dry wounds.

WOUND POWDERS.—One part of iodoform, and eight of prepared chalk, form a splendid dry dressing, to be dusted on to wounds. If the discharge is excessive, four parts of tannin or oxide of zinc may be substituted for four parts of the chalk. When these medicaments are not available the ordinary disinfectant powders used for household purposes form a very good dry dressing, as also does powdered lime. If, when a wound has begun to heal, there is a large gap to fill up, the application of iodoform alone will be found to hasten the filling-up process considerably. It stimulates the formation of granulation tissue.

When a wound has been allowed to become unhealthy and foul-smelling (in which case the fatal consequences previously mentioned are always to be feared), the best treatment is to thoroughly irrigate it, at least twice a day, with a watery solution of corrosive sublimate of strength varying from one part of the drug to 100 of water to one part to 1,000, until the smell is removed, and the discharge assumes a thicker and more healthy appearance. When the presence of grit, splinters, or other foreign body is suspected in the wound, the application of warm bran poultices for a few days is advisable. They should be frequently changed, and never allowed to become sour.

In addition to the local treatment it may be necessary to give internally mild laxatives (Epsom salts from four to eight ounces) every other day until all tendency to fever and inflammation has passed away, and during this time the diet should consist of sloppy bran mashes or green stuff.

For the arrest of bleeding from wounds, the stitching or suturing of wounds and antiseptic surgical methods see pages 55, 60, and 71 (Vol. V.).

SPECIAL WOUNDS.

While the above remarks concerning wounds may suffice as general information on wounds, it becomes necessary to describe in detail certain commonly met with wounds of special character. This because successful treatment of them depends so largely on a proper knowledge of their nature. Their treatment also, as will be seen, necessitates considerable variation from that outlined above. The most important of these special wounds are as follow:—

Open Joint.

An open joint is a wound in the neighbourhood of a joint which has penetrated through the capsular ligament into the cavity of the joint. It is always accompanied by the flow of the lubricating fluid of the joint—synovia or joint oil, and by reason of the difficulty in closing the opening while the flow continues it is one of the most serious injuries which can be sustained by any animal. It frequently results in complete anchylosis or stiffening of the joint, so rendering the animal permanently useless; and the constitutional disturbance resulting from the local pain and inflammation is often so acute as to cause the death of the animal. The knee, the hock and the fetlock are the joints most frequently concerned and on account of the great amount of movement occurring in them the condition is always a serious one. When occurring in joints with less movement or which can be kept in a state of comparative rest recovery is more likely.

Open joint may be caused either *directly* by puncture of the capsular ligament at the time the wound is inflicted or *indirectly* from a previously existing wound by softening of the tissues and ulceration through the capsule. Sometimes it is caused by unskilful probing of a wound near a joint.

SYMPTOMS.—At first the discharge is natural joint-oil—a clear transparent straw-coloured fluid having the consistence of white-of-egg and exhibiting a gummy stickiness when rubbed between finger and thumb. Later on it becomes thicker, yellow in colour and quickly coagulates on exposure to the air. In the meantime the joint becomes very painful, hot and swollen, general febrile symptoms are manifested, there is great distress and much falling off in condition.

TREATMENT.—The principles of treatment are:—"First, the synovial cavity must be thoroughly drained; secondly, the joint must be kept perfectly at rest, and firmly fixed; and thirdly, the discharges must be prevented from decomposing by some efficient system of antiseptic treatment." (Erichsen.)

The details of treatment may be best conveyed by describing the treatment of an imaginary case—First, give the horse a dose of purgative medicine—either an aloetic physic ball or a drench of Epsom salts (10 to 12 ounces) in solution. This is best done at this stage as later on the giving of medicine will disturb the animal too much and he may not be induced to take salts in the food when feverish. If the wound is dirty

it must be washed and sluiced or syringed with recently boiled water containing an antiseptic (corrosive sublimate, a dram to half a gallon of water; or carbolic acid, half ounce to pint of water). Pure iodoform or a half-and-half mixture of tannin and iodoform (tannoform) should then be thickly applied or plugged in (if a punctured wound the dressing may be introduced by means of a gelatine capsule). This dry dressing should be firmly covered with a pledget of antiseptic cotton wool to keep it in position. A moderately tight bandage may then be applied and means taken to limit the movement of the joint (fracture splints may be used). The dressing need not be repeated for a couple of days unless the discharge is so profuse as to soak through the bandage. It should be very carefully removed, disturbing the edges of the wound as little as possible. Repeat the dry dressing and rebandage. Iodoform serves a treble purpose in such cases; it forms a dry dressing, it is an admirable antiseptic and, as elsewhere stated, it hastens the filling up of the wound and the consequent stoppage of synovial flow by promoting formation of granulation tissue. Boracic acid or dry lime may be used if iodoform is not available.

Sometimes it serves well to apply a blister all round the wound in the first instance, the object in view being two-fold; the swelling consequent on blistering helps to fill up the wound and arrest the flow of joint oil and it also assists in retarding movement in the joint.

Open Bursæ and Tendon Sheaths.

Wounds into the sheath of tendons and into bursæ over which tendons play also allow of the discharge of the lubricating synovia, but they are by no means so serious as open joints and usually heal rapidly under the treatment advised for that condition.

Broken Knees.

By this term is meant a wound existing on the front aspect of the knees of horses generally caused by falling. Horses with low tripping action and those which stand with the fore legs far back underneath the body or which are calf-kneed are the most liable to sustain this injury. The gravity of the condition varies considerably. It may be:—

(*a*) A mere abrasion of the skin with the under skin (dermis) and roots of hair uninjured. In such cases a thin layer of the surface skin (epidermis) usually sloughs off and leaves a temporary mark, which however vanishes before long.

(*b*) A cut through the skin. In such cases there may be a downward dissection of the skin forming a flap in which discharges or foreign matter may pocket. As special treatment an incision will require to be made in the centre of the flap at its lowest point to allow of drainage of discharges.

(*c*) Laceration of skin and opening of sheath or bursæ of tendon. A very awkward condition necessitating the maintenance of the knee in a state of complete rest for recovery to occur.

(*d*) Laceration of skin, tendon and capsular ligament of knee joint exposing the knee bones and forming an open joint. A grave and often incurable condition.

The TREATMENT will vary with the severity of the wound. In the less severe cases the injured part should be bathed with tepid water until all the grit and dirt has been gently but thoroughly removed, and if the

pain is very severe this bathing should be continued two or three times a day. If the wound is at all deep, it should be anointed with carbolic oil (strength, 1 in 20), and afterwards a strip of lint soaked in the oil should be applied and kept in position by a lightly-applied bandage.

For success in treating the graver conditions it is a necessity to restrict the movement of the knee as much as possible. To this end it is a good plan to bandage a wooden or leather splint on to the back of the leg, extending from half way down the arm to half way down the cannon bone (see page 266). Stitches are, as a rule, not of much value, and when had recourse to, if the splints are not used, are torn out on the least movement of the joint. Occasionally a little proud flesh may appear, and should be removed by two or three gentle applications of lunar caustic. Dry wound dressing should be applied with a pledget of tow or cotton wool and bandaged in position. In cases of "open joint" (see page 157) it is advisable to first of all irrigate with a 1 in 500 solution of corrosive sublimate and afterwards block up the wound with pure iodoform pressed and kept in position with cotton wool and bandages. All irritant applications should be avoided, at least until the wound has thoroughly healed and the inflammation subsided, when the application of a mild blister will assist in removing any swelling which remains, and will also promote the growth of hair.

Occasionally the injury is so severe as to give rise to more or less fever, which will have to be controlled by the giving of mild laxative and febrifuge medicine (three to four ounces of salts daily), together with about a teaspoonful of saltpetre. This medicine can be given in the feed, which should always for a few days at the first be in the form of sloppy bran mashes, green stuff, or other soft food.

Broken knees very commonly leave, after healing, some evidence of their previous existence, which may or may not constitute unsoundness. Be the blemish ever so small, however, it should be looked upon with suspicion, as indicative in many cases of a tendency to stumble.

Speedy Cut.

By "speedy cut" is meant a wound or bruise on the inside of the fore limb near the knee caused by the hitting of the part with the foot of the opposite limb. "Buck-kneed" horses or those which stand "in at the knees" are particularly liable to this injury, the inner prominence of the knee of such horses being brought into the line of action of the opposite foot during progression, especially if the horse has high knee action at the trot. A speedy cutting horse is always dangerous to ride or drive on account of his liability to stumble and fall, and moreover he is either intermittently lame or liable to become lame at any moment (see page 260). Sometimes in young horses speedy cutting is a sign of muscular weakness and tendency to it passes away on the acquirement of firm condition.

SYMPTOMS.—The injury may be either a wound or bruise. In the latter case there is local heat pain and swelling and in severe cases an abscess may form. Sudden lameness occurs on the infliction of the blow.

TREATMENT.—When wounded, Friar's balsam (compound tincture of benzoin) is a good application. For a bruise in the early stages cooling applications are best and one or other of the following lotions may be used :—

WHITE LOTION.—Sulphate of zinc and sugar of lead (subacetate) of each one ounce ; water one quart.

ARNICA AND CAMPHOR LOTION.—Tincture of arnica one ounce, spirits of camphor two ounces, water one pint.

If an abscess forms it should be lanced at the lowest part, and after draining should be injected with an antiseptic lotion such as:—Carbolic acid, half-ounce, water one pint. If a swelling remains after the acute symptoms have subsided blistering with red mercury ointment (page 75, Vol. V.) will be necessary.

PREVENTION.—Horses addicted to speedy cutting should never be shod with the shoe flush with the wall on the inside. The inner web of the shoe should be raised and as few nails as possible used on the inside. Leather boots shaped to protect the inner aspect of the knee at the seat of the injury and padded with cloth or felt to lessen the jar of the blow are often necessary in spite of their unsightliness.

Wounds from Brushing.

Brushing is the act of hitting the fetlock on the inside with the opposite foot. When happening in the fore limb it is generally due to defective conformation, "lady-toed" horses being particularly liable. The out-turning of the toes tends to throw the fetlock inwards and so into a position in which it is more likely to be struck by the opposite foot. When occurring behind it is most often due to muscular fatigue and want of condition, although some aged horses in full work persistently brush behind.

The severity of the wound or bruise varies considerably and treatment, of a similar character to that recommended for speedy cutting, should be modified accordingly.

PREVENTION.—Shoeing with tips or three quarter shoes often effectually prevents brushing. Lowering the outside wall of the hoof or thickening the inside web of the shoe, so that the fetlock may be thrown outwards away from the line of action of the opposite foot, is also to be recommended, and the hoof ought never to be allowed to grow long. The shoes should be removed at short intervals, every three weeks say, and care taken that the clinches of the inside nails are well sunken. For persistent brushing the use of brushing boots so affixed as to protect the part liable to injury is essential. Sometimes a stout india rubber ring is worn above the fetlock to prevent it being struck by the opposite foot, and although unsightly it is often effective.

Wounds from Over-reach.

Overreaching ordinarily consists in striking some part of the fore limb with the hind shoe or foot. The blow is usually inflicted on the coronet at the heels just at the junction of skin and hoof but sometimes the skin covering the back tendons above the fetlock is cut and torn. It is during the gallop that the injury is most often sustained. In race horses a peculiar kind of overreach, if it may be so called is sometimes observed. The wounds are on the inside of the thigh above the hock and are evidently caused by the parts striking against the back-turned shoes of the fore feet towards the end of a tiring gallop when, from fatigue, the fore feet are not lifted forward in time to be out of the way of the advancing hind limbs.

TREATMENT similar to that recommended for speedy cutting and brushing should be carried out, and with horses having a tendency to injure themselves in this way bandages or guards of cloth, leather or rubber should be worn over the seat of the injury.

SORGHUM POISONING.

S. S. Cameron, M.R.C.V.S., Chief Veterinary Officer.

Numerous fatalities of both horses and cattle have been recorded as a result of feeding too plentifully on plants of the sorghum family when in a green state. In years past the trouble was attributed to the animals being affected with hoven or tympanitis through the formation of gases by the fermentation of the excess of green food. Later on it was put forward by authorities in India that the fatalities were due to the excess of saltpetre (nitrate of potash) which is present in large quantities in the plant tissues of young sorghums, especially during dry periods; but the deaths occur too suddenly, and saltpetre, even if it were not quickly excreted but accumulated in large amount, is so slightly poisonous that the theory was quickly abandoned as untenable.

Recent investigations, particularly those conducted by the Scientific Department of the Imperial Institute in 1902* have however resulted in the discovery of prussic acid and cyanide of potassium in the young sorghum plants in the proportion of 0.2 per cent., and it is apparently capable of proof that it is to the toxic effect of these poisons that the sudden and rapid mortalities are due. The prussic acid is present in dangerous amount only in certain stages of growth (from five weeks to seven weeks usually) and disappears gradually shortly after the blossoming stage, when the ear begins to form; and has completely disappeared when the seed is ripe. It also disappears on drying shortly after being cut. Prussic acid is a very volatile substance and it apparently quickly evaporates when the plant cells are dying and therefore incapable of elaborating more of it.

Its presence would appear to be in inverse ratio to the vigor of growth of the plant. It is found in increased quantity during dry seasons and is almost absent in plants grown quickly on moist land. Stunted crops and crops that have had uneven growth or a check during growth are most likely to contain poisonous quantities of prussic acid. Second growth is also more dangerous than first growth. Unfortunately it is just such crops as are the most dangerous that a farmer is tempted to graze-off, arguing that a stunted crop or second growth is not worth the bother of cutting. All varieties of the sorghum family are liable to contain the poison—none are immune. When grown on land rich in nitrogenous elements (e.g., when manured with nitrate of soda) the amount of poison is increased and by experiment it has been shown that 4 lbs. of sorghum so grown contain sufficient prussic acid to poison an ordinary cow.

Prevention.—To avoid poisoning accidents when feeding sorghums it is advisable to adhere to the following rules:—

1. Never allow stock to have access to growing crops of sorghum, millet, amber cane, Dhoura or Egyptian corn, Kaffir corn, or other plant of the sorghum family. Apart from the danger of poisoning the practice of grazing the crop is a wasteful one.

2. Never feed newly cut sorghum at any stage of its growth, but always allow it to dry or "wilt" for one or two days. If the atmosphere is dry and sunny the danger will disappear more quickly.

3. Never feed immature growth. Feed only in the green state crops which have blossomed and are forming grain.

* Proceedings of Royal Society, London, June, 1902.

4. Only use that sorghum as green feed which has been grown vigorously on moist land. Stunted crops off dry land should be made into hay or ensilage before use.

5. Let the allowance be always moderate in amount with a due proportion of other foods.

TREATMENT.—It will be obvious that on account of the rapidity with which death occurs that treatment of affected animals is of little avail. The line of treatment promising best results is the prompt giving of ammonia stimulants. Allow continuous inhalation of ammonia gas from *strong fluid ammonia* (*Liq. Ammon. Fort.*) and give as a drench dissolved in *cold* water 1 oz. (or even larger doses) of carbonate of ammonium every hour. This latter will have a pronounced beneficent effect on the hoven (tympanitis) which usually accompanies the poisoning. The dose mentioned is for cattle; for horses half that quantity and for sheep and pigs proportionately less will suffice. If carbonate of ammonium is not to hand ordinary baking soda will have the same effect on the hoven, but it has no stimulant properties, and consequently is not a physiological antidote for the poison, as is carbonate of ammonium.

TYPES OF EWES FOR LAMB RAISING.

H. W. Ham, Sheep Expert.

Farmers on the look out for breeding fat lambs find the right class difficult to obtain. During February and March is usually a good time to buy, for when rain comes prices go higher, and as half and three-quarter bred ewes take the rams late, it is yet time to see that the right shaped rams are with them. It is too often the case in dealers' lots, to find very poor specimens of the various breeds joined with them, in order to say they are in lamb. On good healthy country this second rate quality may sometimes pay, but to nothing like the extent it would do if both sides had been the right class. *For the purpose of lamb-raising it is better in most* cases to buy good shaped young half-bred ewes at a fair price than to buy fine comebacks or Merinoes at less money. It is true coarse wool is now lower in value, but the price per head for the lamb for the time kept comes first, and weight of useful wool per head next. The class desired is found in the half-bred ewe, when from nice round barrelled Merino ewes by Lincoln or Leicester rams.

Consequent on the class referred to being scarce many farmers are forced to take fine comebacks and Merinoes. In this case if they are mated with good shaped Lincoln rams a fairly early maturing lamb will be the result, and the ewe lambs will be worth holding if the season turns bad. They will make ideal ewes for future lamb-raising either for the grazier or the farmer. Many of them will of course come rather strong in the grade of wool for present market conditions. This grade of wool may be down in price for a few years now, but if the sheep suit the situation and the purpose of the breeder this fact should not alone be the cause of changing; they are bulky cutters and will pay well. With ewes of this class, rough in the wool and rather coarse in flesh, there is no cross for all round purposes, to equal a good fleeced thick fleshed Shropshire

(unless it is a Southdown and a good fleeced one is not easily obtained). This cross brings the fleece to a grade that is used largely in the manufacture of goods for the middle and lower classes and consequently there is always a certain market at fair prices. It is the true farmer's cross; a fine comeback under his conditions of feeding on fodder crops and stubbles is too delicate a fibre to stand the dust and rubbing that a farmer's flock undergoes—a stronger fibre stands punishment better. Fine comebacks and Merinoes want cleaner conditions to get the price per pound that is necessary to get to make up the difference for weight per head that good crossbreds will give. Some of our leading Merino flocks of course, cut equal to crossbreds, but these are out of the question with the average farmer.

Generally speaking fine crossbreds and Merinoes should be mated with longwool rams. It improves the colour of the mutton for export and gives a bulky payable fleece. It does not matter a great deal which of the longwool breeds are used, whichever are the best girthed and level shouldered, combined with good style and covering of fleece, will be found in the end to give the best results regardless of whether they are Lincolns or Leicesters. Still, Lincolns are wool-growers' sheep to a greater extent than the Leicesters.

At best, Shropshires are only a fair fleeced breed, but it is when they are mated with crossbred ewes with a long and bulky staple such as the Lincoln-Merino cross, that the half Shropshire inherits most of the bulk and length of staple from the ewes. If the ewes are by Leicester rams from a plain clean pointed line of Merinoes then the Shropshire ram should be a well covered one, as well as good girthed, in order to correct somewhat the thinness of undercovering and bareness of points which is always a result of careless Leicester crossing.

Now that many of our Merino breeders are going to the extreme in plain bodied Merinoes, many of the cull ewes, which the farmer generally buys, will be bare legged and bare faced. The demand for longwool rams has brought out lots of bare sheep that when mated to the cull ewes will only increase the evil. It is wonderful where all the longwool rams come from in such a short space of time; three years ago they were very scarce, and now they are about in hundreds, for second class breeders kept any white faced ram lambs from their crossbred ewes when the demand came about.

Some farmers on well improved freehold properties are now proving that with half Shropshire ewes from good first cross Lincoln-Merinoes, it works well to keep to pure Shropshire rams every season, using only good fleeced and shapely ones. Sheep bred this way cut valuable fleeces of medium grade, and each generation they are crossed by pure Shropshire brings them nearer to the ideal farmer's sheep. Each year these farmers fatten and sell the wether lambs, worst ewe lambs, and cast ewes.

Shropshire-Merino is not a good cross, but there has been a lot of this crossing done. It is best to cross again with longwools; otherwise there is not sufficient width of frame nor bulk of fleece to be profitable to the farmer. In fact, if the sheep are from narrow forequartered, woolly headed, short stapled Merinoes, they are far from a good class of sheep; and if by woolly headed, weak necked Shropshires, inferior in wool, as the majority of so-called Shropshires have been, then they are about as unprofitable a sheep as it is possible to find. Descendants from the latter can be only third quality freezers and it takes a long time to get them to

that; they are always lean forequartered, no matter how they may be covered on the hind parts.

For some cold districts fine comebacks are best suited, and this must always have an influence, for in such situations, the coarse crossbreds are at a disadvantage in the winter, their size being too great to keep in good condition on scanty feed. For graziers on light carrying second class country, a comparatively small sheep is required, such as fine comebacks or thick set Merinoes; for small farmers Southdowns or Shropshires. There are of course tracts of country where it is an uphill game to raise any cross or breed successfully, being particularly liable to diseases due to excessive rainfall and faulty drainage, &c.

MAIZE GROWING EXPERIMENTS.

J. M. B. Connor, Dairy Supervisor.

On the 19th October last, with the object of ascertaining by practical experience and observation the most profitable maize to grow for fodder and seed purposes respectively, nine varieties of maize obtained from the Department were planted, viz.:—

American Varieties.—Hickory King, Triumph Flint, North-Western Dent, Boone County Special.

Victorian Varieties.—Flat Red, Ninety Day.

Sydney Varieties.—Flat Red, White Horse Tooth, Yellow Moruya.

PREPARATION OF THE SEED BED.—The experiment was conducted on a very poor light sandy soil with a red clay subsoil (see analysis on page 168). The plot was dug twice a spit deep, and farmyard manure that had been exposed to the weather for three years was dug in. Before the seed was planted, the ground was thoroughly pulverized and worked up to a very fine tilth, and marked off into check rows 2 ft. 6 in. apart, two seeds being dropped into a hole three inches deep at each intersection.

GROWTH.—Every seed germinated, and threw up a strong healthy plant. Triumph Flint was the first to show through, nine days after planting, the ground having been kept constantly stirred with the hoe. As the plants came up, the weakest was pulled up, and only one stalk allowed to remain. On the 29th October there were 78 points of rain, 3rd November 60 points, 17th November 80 points. Up to the 18th November, the North-Western Dent was the highest, and showed the most vigorous growth and stooling properties, the Victorian Flat Red and Sydney Flat Red varieties coming a close second.

On 22nd November, a thunderstorm registered 47 points. On the 4th December, nearly every plant of the Triumph Flint had stooled, but showed a more delicate green in its foliage than the other varieties. The North Western Dent up to this time was a vigorous grower, showing a deep green colour with plenty of foliage. Some of the plants of Boone County Special were short of growth and delicate looking. The Victorian Flat Red had made vigorous growth, was a good colour, and next in abundance of flag to North Western Dent.

On 14th December, Triumph Flint and North Western Dent commenced to flower (4 feet high). During the latter part of that month a couple of days of rain (4 inches) was a great help.

On 10th January, Hickory King (8 feet high and starting to flower) had stooled out considerably, showing abundance of foliage, and great thickness of stem. Boone County Special (9 feet high) was looking splendid, showing great bulk of fodder, and stooling freely. Triumph Flint and North Western Dent (4 ft. 6 in. high) were starting to cob, no foliage. The other varieties averaged 7 ft. 6 in. high, and all showed

BIRD'S EYE VIEW OF THE EXPERIMENTAL PLOT.

good growth, with plenty of broad leaves. The Sydney White Horse Tooth, Victorian Flat Red, and Yellow Moruya, were 8 feet high, and had not yet started to flower. The Ninety Day was cobbing, but its height (4 feet) and foliage were poor.

CONTINUOUS CULTIVATION ESSENTIAL.

During the whole of this time the rows were hoed once a week to a uniform depth of 2 inches and the moisture thereby considerably conserved. By continuous stirring of the surface soil, it was found that the loose mulch, especially during the hottest days (106 deg. to 112 deg. in the shade) was of great value. Cultivation deeper than between 2 and 3 inches injured some of the surface roots, and the plant showed a check in growth at once. This prompted examination of the roots of the plants at different periods of their growth. It would appear that the deep roots

of the maize plant anchor it to the soil and enable it to stand up against adverse winds and to maintain its upright position, and in a luxuriantly growing crop like the one under review (10 ft. 6 in. high in places), the roots must necessarily go down a good depth.

On examining the root system of these plants at matuirty, I found that the layer roots, which spread laterally in all directions, reached easily from 18 inches to 2 feet, while the rootlets and root hairs were so close and numerous as almost to defy description. When the plant has fully matured the root system has become so extensive and involved that it is a complete network.

PLOT OF HICKORY KING, AN IMPORTED VARIETY.

Any one who will take the trouble to wash away the soil from the roots of a maize plant, will readily observe how wonderful it is, and how easily one may understand the power of the plant to withstand drought and to build up so large a structure and bulk of feeding matter in such a short time.

From observations made, it was apparent that deep cultivation is injurious to the plant, causing the destruction of the surface feeding roots, checking the growth and thereby reducing the bulk of the crop. What applies to this particular plant will apply in a more or less degree to other

crops with roots close to the surface, and a shallow surface mulch of fine soil is as effective in conserving moisture as a deeper one.

The great difference in height and bulk of fodder secured from the nine different varieties of maize grown under precisely the same cultivation and climatic conditions, will be readily observed by the aid of the accompanying illustrations. The photographs were taken on January 20th, three months after planting, and on the morning after the record visitation of the hot spells of weather ranging from 102 deg. to 112 deg. in the shade.

AVERAGE SAMPLE OF EACH OF THE VARIETIES GROWN.

(1) Hickory King, (2) Yellow Moruya, (3) Sydney Flat Red, (4) White Horse Tooth, (5) Boone County Special, (6) Victorian Flat Red, (7) North Western Dent, (8) Triumph Flint, (9) Ninety Day.

Notwithstanding this aggregation of excessively hot days the soil, 3 inches under the surface mulch, was perfectly moist; and the plants showed no check in their luxuriant growth. This speaks volumes for the continuous surface cultivation of the soil, as the maize received no artificial moisture during the whole of this trying period.

A leading dairyman who witnessed the measurement of the Hickory King variety (10 ft. 4 in.) and Boone County Special (10 ft. 6 in.) was

surprised at the luxuriant growth of fodder, and the effectiveness of a loose soil mulch in conserving of moisture in the soil; he was fully convinced of the great advantage to be gained by planting maize in drills and cultivating between the rows.

The following particulars as to the actual stools thrown up from each variety are here recorded for general information.

	Seed.	Stalks.	Height on 20.1.08.
Boone County Special ...	... 20	45	10 ft. 6 in.
Hickory King ...	... 20	58	10 ft. 4 in.
Victorian Flat Red ...	... 5	12	10 ft. 4 in.
Sydney Flat Red ...	... 5	12	10 ft.
White Horse Tooth ...	... 5	12	9 ft.
Yellow Moruya ...	... 6	9	9 ft.
Triumph Flint ...	... 20	50	5 ft.
North Western Dent ...	... 20	43	4 ft. 6 in.
Victorian Ninety Day ...	... 7	22	4 ft.

ANALYSIS OF SOIL AND SUBSOIL.*

(Three months after manuring.)

	Soil.	Subsoil.
Nitrogen ...	0·372 per cent.	0·085 per cent.
Phosphoric Acid ...	0·045 „	0·005 „
Potash ...	0·182 „	0·098 „
Lime... ...	0·052 „	0·101 „
Chlorine ...	0·002 „	0·002 „

AVAILABLE, IN 2 PER CENT. CITRIC ACID.

	Soil.	Subsoil.
Phosphoric Acid ...	0·039 per cent.	0·003 per cent.
Potash ...	0·012 „	0·035 „
Humus ...	1·42 „	...
Nitrogen in humus ...	0·22 „	...

This soil on analysis may be said to be poor in phosphoric acid and lime, fairly well supplied with potash, and over the average in nitrogen. However, the available content of both phosphoric acid and potash is sufficient to stamp it as fertile and in no immediate need of either. It is of a light sandy nature and very porous, whilst the subsoil is of a clayey nature and well suited for retaining moisture.

Apart from the absolute food and money value, as shown later on, and compared with bran as a basis, maize growing is extremely valuable as a soil improver. This phase is overlooked by most farmers. One of its principal features in this regard is the large amount of humus which it adds to the soil by the decomposition of the mass of roots already referred to, thereby improving the texture of the soil. When grown in rows, and properly cultivated, land overgrown with weeds is effectively cleaned, and few crops can be used so well for that purpose for the reason that the period when most of the weeds germinate and thrive is also the time when constant cultivation of the soil is given to the maize crop.

The continuous stirring of the soil allows the land to become so well oxidized through effecting free circulation of air that a considerable portion of the mineral plant foods becomes available.

YIELD PER ACRE AND ANALYSES.

On January 20th, three months after sowing, most of the varieties were in a fit state for feeding as green stuff, and it was accordingly decided to estimate the commercial value of the crop at that stage. An average

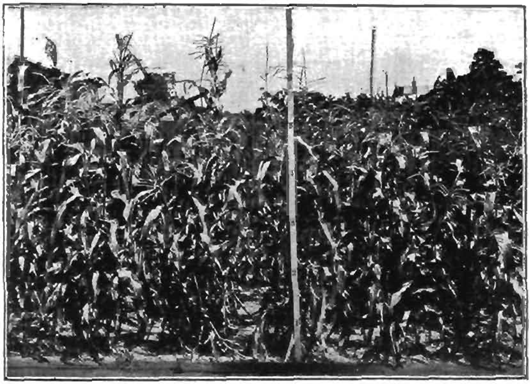
*Analysis by Mr. P. R. Scott, Chemical Laboratory, Department of Agriculture.

portion of the crop of each variety grown on a similar area was cut, weighed and analysed, with the result shown in the following table:—

ANALYSIS OF MAIZE (9 VARIETIES).*

The chemical composition is shown in percentages of the whole.

Variety.	Hickory King.	Sydney Flat Red.	Boone County Special.	Yellow Moruya	Sydney White Horse Tooth.	Victorian Flat Red.	Triumph Flints.	Victorian Ninety Day.	North-Western Dent.
Weight per acre	26 tons 5 cwt.	22 tons 11 cwt.	17 tons 17 cwt.	17 tons ..	12 tons 11 cwt.	11 tons 12 cwt.	9 tons 11 cwt.	9 tons 11 cwt.	6 tons 15 cwt.
Moisture	82·43	83·73	81·89	79.53	78·86	83·66	81.48	84·25	72.74
Ash	1·66	1·63	1·64	1·47	1·67	1·40	1·60	1·48	1·89
Albumenoids } Total	1·41	1·90	1·85	1·71	1·87	1·35	1·69	1·47	2·02
Amides } Protein	0·69	0·75	0·75	0·83	0·85	0·70	0·83	0·85	1·02
Crude Fibre	4·91	3·88	4·01	4·63	5·62	4·24	3·86	3·25	5·09
Nitrogen, free extract, starch, sugar, &c. ..	8·37	7.42	9·02	11·14	10·33	8·08	9·91	8·18	16·44
Ether extract, fat and colouring matter ..	0·53	0·69	0·84	0·69	0·50	0·57	0.63	0·52	0·80



TRIUMPH FLINT AND NORTH WESTERN DENT, IMPORTED VARIETIES.

The three rows on left are Triumph Flint, and the three rows at right are North Western Dent.

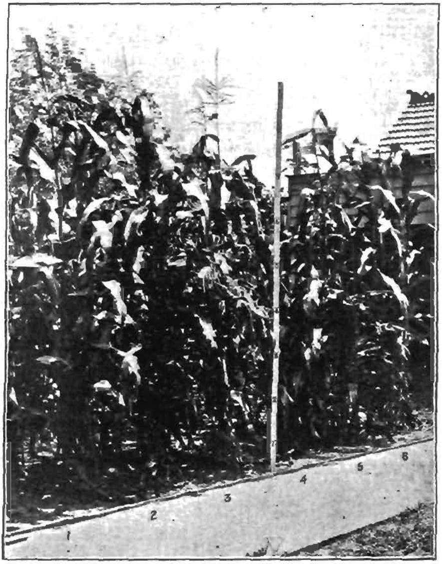
COMMERCIAL VALUE.

In estimating the commercial value both the weight of crop per acre and the nutritive composition have to be taken into consideration. It will be observed from the above table that there is considerable variation in both of these qualities—Hickory King showing the greatest weight per acre (26 tons 5 cwt.), while North Western Dent, although the smallest yielder in weight, is the richest in protein and carbohydrates.

Comparison with such a commonly used food stuff as bran will perhaps best serve to illustrate the value of the different varieties of maize based on weight of crop and nutritive value. Taking the average analysis of

* Analysis by Mr. P. R. Scott, Chemical Laboratory, Department of Agriculture.

bran as containing—protein, 11.2 per cent.; carbohydrates, 42.2 per cent.; fats, 2.5 per cent.; and allowing it to be worth 1s. per bushel or £5 12s.



BOONE COUNTY SPECIAL (IMPORTED) AND LOCAL VARIETIES.

1, 2 and 3, Boone County Special; 4, Victorian Flat Red; 5, Sydney Flat Red, 6, White Horse Tooth.

per ton, then the commercial value per acre of the different varieties is as shown in the following table:—

TABLE SHOWING VALUES, WEIGHT AND FEEDING PROPERTIES COMBINED.

Maize 3 months' growth.	Value per ton.	Yield per acre.	Value per acre.	Equal to bran (approximately).
	£ s. d.	tons cwt.	£ s. d.	tons.
Hickory King	1 1 9	26 5	27 12 6	5
Sydney Flat Red	1 3 0	22 11	25 17 6	4¾
Boone County Special	0 18 3	17 17	16 5 0	3
Yellow Mornya	0 18 4	17 0	15 11 8	2¾
Sydney White Horse Tooth	1 1 0	12 11	13 3 6	2⅓
North Western Dent	1 19 0	6 15	13 2 0	2⅓
Triumph Flint	1 6 0	9 11	12 7 0	2
Victorian Ninety Day	1 2 4	9 11	10 12 0	1¾
Victorian Flat Red	0 15 6	11 12	8 18 0	1½

Each farmer can best calculate for himself what is the cost per acre of growing, harvesting, and feeding maize at per acre and can then calculate the saving that he will effect by growing maize over feeding purchased bran. Take the very poorest of the above yields (Victorian Flat Red) and it will be scarcely contended that the cost of growing and feeding it will approach the return yielded (£8 15s. per acre).

Incidentally attention may be invited to the fact that the two most commonly grown maizes in Victoria are those varieties which in the experiments now recorded are shown to be the least profitable.

STATISTICS.

Rainfall in Victoria.

FOURTH QUARTER, 1907.

TABLE showing average amount of rainfall in each of the 26 Basins or Regions constituting the State of Victoria for each month and the quarter, with corresponding monthly and quarterly averages for each Basin deduced from all available records to date.

Basin.	October.		November.		December.		Total for Fourth Quarter.	Average for Fourth Quarter.	Total Amount for Year.	Yearly Average.
	Amount, 1907.	Average.	Amount, 1907.	Average.	Amount, 1907.*	Average.	*		*	
Glenelg and Wannon Rivers ..	1·88	2·75	2·01	1·74	1·52	1·53	5.41	6·02	24·61	27·10
Fitzroy, Eumerella and Merri Rivers	2·55	2·91	2·49	1·82	1·87	1·59	6·91	6·32	27·95	29·82
Hopkins River and Mount Emu Creek	1·47	2·76	2·00	1·97	3·28	1·51	6·75	6·24	23·25	26·17
Mount Elephant and Lake Corangamite	1·60	2·67	1·65	1·87	2·20	1·39	5·45	5·93	21·58	24·84
Otway Forest	3·33	3·66	2·08	2·39	3·89	1·89	9·30	7·94	33·57	40·56
Moorabool and Barwon Rivers ..	1·39	2·56	1·66	2·03	5·03	1·56	8·08	6·15	23·89	25·53
Werribee and Saltwater Rivers ..	1·39	2·68	1·66	2·18	4·65	1·69	7·70	6·55	20·17	26·80
Yarra River and Dandenong Creek	2·52	3·23	3·23	2·86	5·91	2·59	11·66	8·68	31·56	35·18
Koo-wee-rup Swamp	2·73	3·49	2·21	2·66	5·35	2·14	10·29	8·29	31·01	34·69
South Gippsland	3·25	3·49	2·16	2·80	4·40	2·59	9·81	8·88	35·27	39·14
La Trobe and Thomson Rivers ..	3·62	3·53	2·14	2·79	4·98	2·56	10·74	8·88	34·23	36·20
Macallister and Avon Rivers ..	1·33	2·82	0·88	2·34	3·53	2·26	5·74	7·42	17·27	26·90
Mitchell River	1·48	2·91	1·36	2·25	2·61	2·12	5·45	7·28	18·19	30·48
Tambo and Nicholson Rivers ..	1·59	2·77	1·51	1·96	2·93	2·15	6·02	6·88	17·41	29·13
Snowy River	1·48	3·03	1·90	2·49	2·92	3·09	6·30	8·61	23·16	38·13
Murray River	0·66	1·92	1·88	1·58	2·38	1·35	4·92	4·85	15·40	22·11
Mitta Mitta and Kiewa Rivers ..	1·32	3·05	2·98	2·48	3·68	1·94	7·98	7·47	26·80	34·70
Ovens River	1·47	3·86	3·44	2·95	2·94	2·36	7·85	9·17	29·27	41·33
Goulburn River	0·95	2·42	2·21	1·99	2·89	1·48	6·05	5·89	21·53	26·26
Campaspe River	0·68	2·29	1·46	1·83	3·42	1·50	5·56	5·62	20·48	25·50
Loddon River	0·46	1·72	1·39	1·53	3·47	1·13	5·32	4·38	15·54	19·01
Avon and Richardson Rivers ..	0·27	1·42	1·28	1·25	1·69	0·98	3·24	3·65	13·96	15·87
Avoca River	0·35	1·67	1·23	1·39	2·19	1·05	3·75	4·11	13·62	17·47
Western Wimmera	0·93	2·05	1·32	1·25	0·83	1·17	3·08	4·47	18·54	19·73
Eastern Wimmera	0·62	2·42	1·53	1·59	1·31	1·40	3·46	5·41	18·00	22·45
Mallee country	0·27	1·20	1·31	0·92	1·71	0·76	3·29	2·88	11·60	13·83
The whole State	1·20	2·36	1,77	1·80	2·84	1·56	5·75	5·72	20·43	25·22

* Figures in these columns are subject to alterations when the complete number of returns for December has been received.

P. BARACCHI,

Government Astronomer.

Perishable and Frozen Produce.

Description of Produce.		Exports from the State.		Deliveries from the Government Cool Stores.	
		Quarter ended 31.12.1907.	Quarter ended 31.12.1906.	Quarter ended 31.12.1907.	Quarter ended 31.12.1906.
Butter	lbs.	19,271,974	23,995,196	14,052,640	17,525,704
Milk and Cream ...	cases	15,406	9,071	...	532
Cheese	lbs.	354,360	253,200	6,000	9,100
Ham and Bacon ...	"	683,040	737,280	...	...
Poultry	head	22,465	21,260	7,232	3,042
Eggs...	dozen	18,306	26,740	...	6,225
Mutton and Lamb	carcasses	540,053	589,166	120,778	117,264
Beef	quarters	113	2,368	...	...
Veal	carcasses	930	2,572	371	472
Pork...	"	61	385	...	15
Rabbits and Hares ...	pairs	115,122	110,910	22,982	44,118
Fruit	cases	4,305	24,21[illegible]	580	...
" Pulp	"	175	1,554	...	...
Sundries	lbs.	...	...	44,583	19,671

R. CROWE, *Superintendent of Exports.*

Fruit, Plants, Bulbs, Grain, &c.

Goods.	Imports.		Exports.		Goods.	Imports.		Exports.	
	Inter-State.	Over-sea.	Inter-State.	Over-sea.		Inter-State.	Over-sea.	Inter-State.	Over-sea.
Apples ...	11,349	34	112	1	Oranges...	72,308	863	95	442
Apricots ...	32	—	1,979	613	Oats ...	24,858	—	—	—
Almonds ...	—	97	—	—	Onions ..	36	—	—	—
Bananas, b.s.	104,594	—	—	—	Pineapples	12,658	—	73	297
Bananas, c/s.	20,115	175	177	169	Pas. fruit	6,210	—	7	1
Barley ...	10,032	595	—	—	Plants ...	118	186	15	14
Bulbs ...	—	796	3	—	Potatoes	2,777	1	—	—
Beans ...	252	—	—	—	Peas ...	1,606	—	160	—
Currants	2	2,350	—	—	Peanuts...	—	170	—	—
Citrus fruit	2	—	—	—	Plums ...	71	—	1	677
Cherries ...	736	—	317	2,732	Pears ...	70	10	—	—
Cucumbers	6,452	—	13	2	Peaches...	138	—	715	330
Dried fruits	160	1,864	—	2,020	Rye ...	56	—	—	—
Dates .	—	1,060	1	—	Rice ..	—	15,977	—	—
Figs ...	13	320	4	—	Seed ...	959	2,518	—	—
Gooseberries	195	—	24	—	Tomatoes	6,620	—	5	20
Grain ...	341	—	—	—	Wheat ..	4,204	34	—	—
Grapes ...	32	—	1	—	Yams ...	—	638	—	—
Lemons ...	8,145	3,494	47	516	Str'wberr's	12	—	1	—
Loquats ...	207	—	1	3	Walnuts	—	—	5	—
Maize ...	342	—	—	—	Jams, Sauces, etc.	—	—	—	396
Mixed fruit	192	—	1	118	Cnd. fruit	—	—	—	7,008
Melons ...	34	—	—	—	Raspberri's	4	—	—	—
Marrows ...	7	—	—	—	Vegetables	365	—	—	—
Nutmegs ...	—	139	—	—					
Nuts ...	—	617	—	—					
Total ...	163,234	11,541	2,680	6,174	Grand Totals	296,304	31,938	3,777	15,359

Total number of packages inspected for the quarter ended 31st December, 1907 = 347,378

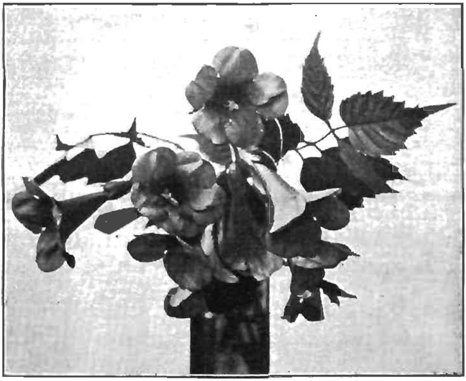
J. G. TURNER, *Senior Inspector Fruit Imports and Exports.*

GARDEN NOTES.

J. Cronin, Principal, School of Horticulture, Burnley.

The Tecoma.

Tecoma is a genus of evergreen and deciduous climbing plants and shrubs, many of which are excellent subjects for the gardens of this State. The tecoma is found native in many parts of the globe, several species being indigenous to Australia. It is closely allied to Bignonia, a genus containing some of the finest climbing plants in cultivation, and at present many kinds are described in nurserymen's catalogues of plants as synonymous with Bignonia. The flowers of most of the species are produced during summer and are a feature in many gardens. They are borne in large bunches, the individual flowers being large and tubular in form, and the colour of many kinds bright orange or yellow.



TECOMA RADICANS, VAR. MAJOR.

The climbing kinds are useful in mixed shrubberies or borders and are particularly effective when trained on walls or fences. The usual plan adopted is to treat the deciduous kinds as pillar plants and the larger growing as plants to cover a trellis or to mingle with the growths of trees. The shrubs are evergreen and although few in number are among the most suitable for small garden borders. They are sufficiently hardy to endure the conditions generally obtaining in cottage or villa gardens, and are bright and effective for several weeks of summer.

Florists have not effected much improvement with the tecoma, few hybrids of value being noted. One of the best of these is Tecoma Smithii, a variety raised in South Australia, and generally considered to be one of the finest garden shrubs extant.

CULTURE.

The most suitable soil is a light loam, but in this respect the tecomas—or most of them—are accommodating, thriving satisfactorily in any fair garden soil. Fine specimens may be seen in the metropolitan district, growing in soils varying from a light sandy to a heavy stiff, clay loam. Like most of our cultivated plants they fail under sour soil conditions, requiring a drained and sweet soil, even if poor and rather dry, to produce satisfactory specimens. In poor soils well rotted stable manure should be incorporated to a depth of eighteen inches, but hot forcing manures should not be used when setting out young plants.

The autumn is the best time to plant the evergreen kinds from pots, affording the plants an opportunity of being established before the hot and dry weather sets in. In districts where severe frost is the rule, late spring planting is best, especially for the grandiflora varieties. The young plants will require to be watered and tended until established, when they will endure severe conditions without suffering greatly. Deciduous kinds are often grown in the open ground by nurserymen. Any removal direct to the permanent positions for such kinds should be carried out in the dormant season.

Tecomas are propagated from cuttings of the matured growths, from roots of certain kinds—radicans and its varieties for example—and from seeds. Some kinds strike readily in winter from cuttings of the matured growths treated in the same manner as rose cuttings, *i.e.*, taken with a "heel" and inserted firmly in sandy soil in the open ground, while cuttings of others difficult to "strike" in the open are grafted on roots of the free growing kinds. Most of the tecomas can be readily increased by layering the branchlets, a means of propagation frequently adopted by nurserymen. Plants are easily raised from seed if available, this being the usual means of raising T. Smithii, a variety which produces seed freely.

The kinds and varieties most worthy of cultivation that are obtainable here include:—*Capensis grandiflora, jasminioides, radicans, stans,* Guilfoylei, Mdme. Galen, Manglesii, and Smithii.

Flower Garden.

Bulbs of spring blooming bulbous plants should be planted early in March. In most cases no manure is necessary unless the soil is very dry and poor, when some well rotted stable or cow manure, or leaf mould, should be mixed with the soil to a depth of about one foot. A light dressing of superphosphate and bone-dust—equal parts—is the most satisfactory fertilizer for a number of bulbous plants. This should be well distributed through the soil, but no hot manure should on any account be allowed in proximity to bulbs. The depth to plant is regulated according to the size of the bulbs, small bulbs such as Ixias, Freesias, &c., being found to succeed best when covered with about an inch of soil, while larger kinds will require to be planted at a depth of from three to six inches, according to size and genus. Light soils should be trodden to a condition of firmness before planting the bulbs.

The principles of manuring are often better known by amateur gardeners, who grow a few plants of some special kind for exhibition purposes, than by professional cultivators who grow a large number of plants with a view of supplying the plants or their products for sale. In the former

case the cultivator, in addition to a thorough preparation and manuring of the soil, supplies some rapid acting fertilizer to assist in the development of the plants, while the trade grower is content to depend on the initial preparation. The use of manures in a liquid form is popular with growers of florists' flowers, and the results are usually satisfactory when the grower becomes acquainted with the needs of the plants and the particular form of stimulant required. The most common cause of failure to produce maximum results is in the strength of the manure used and the frequency of its application. Weak solutions of such manures as nitrate of soda or sulphate of ammonia will be found to greatly benefit the plants, while strong solutions will inevitably destroy the tender feeding roots. The manures mentioned are in general use among Chrysanthemum growers, and should not be used at a stronger rate than one ounce to four or five gallons of water, or more frequently than say once a week.

Spring blooming herbaceous plants should now be divided and replanted in well prepared soil. The plants root readily after being divided and make good progress before the soil becomes cold. The divisions will require to be supplied with water during dry weather until fairly started into growth. Seeds of annuals that will endure frost may be sown for transplanting. Plants that would rarely be injured in the coastal districts by frost are often destroyed in other parts of the State, so that in many instances the plants described as hardy annuals fail to justify the description. A local knowledge of the kinds that will thrive during winter is valuable in making a selection.

Kitchen Garden.

During favourable weather celery, cabbage, and cauliflower plants should be set out. Cool moist weather is most suitable for the work of transplanting generally. Sufficient water should be applied to each plant to settle the soil thoroughly.

Ground should be prepared for future planting as it becomes vacant, and seeds of saladings and other vegetables appropriate to the season and requirements sown.

THE PROCLAIMED PLANTS OF VICTORIA.

(*Continued from page 80.*)

Alfred J. Ewart, D.Sc., Ph.D., F.L.S., Government Botanist; and J. R. Tovey, Herbarium Assistant.

Paterson's Curse, or Purple Bugloss.

Echium violaceum, Linn. *Boragineæ.*

An annual or biennial; stem 1 to 3 feet high, erect or ascending, diffusely branched. Radical leaves lanceolate, stalked, the stem-leaves spreading obtuse, cordate and sometimes dilated at the base. Flowers showy, dark blue-purple, in numerous one-sided spikes, forming a long terminal curved panicle, corolla often an inch long; the narrow part of the tube very short, spreading into a broad campanulate throat, with a very oblique limb, the lower lobes rather longer than the longest stamens.

An introduction from Southern Europe. It is not injurious to stock, and is considered to be a very fair pasture plant in its young state, but when the plant matures, the flower-stalk is very rough and hairy, so that stock do not touch it, and when it seeds and dies off, all the grass is killed underneath, hence the ground is left quite bare. It should be hoed up before it seeds, piled and burnt.

Proclaimed for the Shires of Towong (1904) and Maldon (1908).

THIRD PROGRESS REPORT ON VITICULTURE IN EUROPE.

F. de Castella.

Viticulture in Portugal.

I have the honour to report as follows on the result of my inquiries in Portugal. I arrived at Oporto, from London, on 30th September. After a couple of days, lost through my being laid up with a severe attack of influenza, I presented the letters I had brought with me from London to the different wine firms at Villa Nova de Gaia, the suburb just across the river and outside the "Octroi" boundary of Oporto, where the wine merchants have their lodges or armazens. Villa Nova is the centre of the Port Wine trade of the world. I was very well received and invited to visit numerous vineyards in the Alto Douro by the merchants to whom I had introductions, who either own vineyards there, or who make arrangements with owners for the purchase of their crop. Mr. Grant, British Consul at Oporto, also gave me much valuable assistance.

I then proceeded to the Alto Douro, the true "Port" country situated some 50 miles up the Douro from Oporto, near which town no Port is made. I spent a fortnight in the Alto Douro during which time

PLATE 22.

A. J. Ewart Direx

PATERSON'S CURSE.

the vintage was in full swing. I was able to see it in all its stages and to collect full information concerning the making of Port. I spent several days at each of the following vineyards:—Quinta de Boa Vista, the property of Messrs. Offley, Cramp, and Forrester; Quinta de Malvèdos, belonging to Messrs. W. and J. Graham; and Quinta de Roriz, owned by Mr. Christiano van Zeller. The whole produce of the last vineyard is taken by the firm of Gonzales, Byass, and Coy., by arrangement with the proprietor. I also visited several other vineyards near Tua.

On my return to Oporto I spent a few days among the armazens of the wine merchants at Villa Nova, gaining information concerning the after handling of Ports which will, I hope, prove useful to our growers on my return. I also made arrangements for the purchase of some of the samples of wine you directed me to secure. These will be forwarded to the Agent-General, who will send them on to Melbourne. I also made provisional arrangements to secure cuttings and grafted rooted vines of the principal wine and table grapes which could with advantage be introduced to Victoria. I also visited the Quinta de Vaccaria, near Regoa, where, for many years, the Portuguese Government conducted an experimental vineyard.

After a couple of days of torrential rain, during which it was impossible to do anything, I proceeded to Lisbon. I was very well received by Sr. Alfredo Carlos le Cocq, Director of Agriculture, who each day placed officers of his Department at my disposal, who could speak either French or English, thus greatly facilitating my investigations and enabling me to thoroughly study vine-growing and wine-making methods in parts of the country where the industry is not in the hands of English merchants as it very largely is on the Douro. Near Lisbon there are several wine districts differing from each other in several important particulars. I was able to study vine-growing in the neighbourhood of the following centres:—Santarem, Almeirim, Torres Vedras, Pinhal Novo, and Collares.

Though cultural and wine-making methods differ much in different parts of Portugal, there are some general features that strike one as being peculiar to the country. All vineyard work is performed by hand. During my travels in Portugal I did not see a vineyard plough or scarifier except in the collection of the Agricultural College at Santarem. Cultivation is nevertheless deep and very thorough. This no doubt accounts for the fertility of the vineyards in spite of the dryness of the climate. The different cultural operations are performed with the hoe, different shapes being used according to the season. The efficient manner in which the work is carried out and the speed with which it is executed are remarkable. Vine dressing in the Peninsula, is a trade to be learnt like boot making, or any other trade, instead of being performed by casual hands who have often never seen a vine before, such as we often have to depend upon for the work in Australia.

An interesting feature is the closeness of the planting, in spite of the dryness and warmth of the climate. The distance apart varies from district to district but except among the overhead trellises of the Minho (Northern Portugal) there are not, as a rule, less than one thousand vines per acre and frequently considerably more. In the earlier days of American reconstitution, wider planting was recommended and tried but the old distance apart has usually been reverted to, as has also happened in France.

Subsoiling is very carefully carried out: in some parts to a truly extraordinary depth. No vineyards are ever planted now-a-days without the ground being first hand trenched to a depth of at least 2 feet.

The vines are usually rod pruned and allowed to grow freely during the summer without tying up or topping. One or more small stakes are usually employed to support the rod or leader. Training on wires is coming into use in some parts but it is by no means general.

Reconstitution has been a great success in Portugal. The freedom from excess of lime of most of its soils has much simplified the problem and rendered possible the use of many stocks which prove unsatisfactory in calcareous soils. All the American varieties used have come from France, Portuguese growers evidently preferring to try those which had already proved their value in that country instead of raising new seedlings of their own. The different stocks as well as the scions grafted on them can be most conveniently dealt with in connexion with each different district.

By far the most striking fact in connexion with Portuguese reconstitution is the suppression of the nursery, in the sense in which we understand it, that is to say, the nursery of bench grafted cuttings. Portuguese vineyards are now-a-days exclusively established by means of vineyard grafting. Nurseries exist, but they are only for the propagation of the ungrafted American stocks. These are planted out in the vineyard and grafted the following year. This system is so very different from that of France, which we have adopted in Australia, that I made repeated inquiries, but wherever I went I found vineyard grafting to be the method used. Many growers have tried the French system of planting nursery struck bench grafted vines, but they have abandoned it in favour of vineyard grafting. Many vineyards, thus reconstituted, are owned by Englishmen keen on using the most efficient system. Wherever I went, whether in English or Portuguese owned vineyards, the opinion, often after careful comparative experiments, was always strongly in favour of vineyard grafting. The large number of vineyards I saw reconstituted in this way and remarkable for their evenness, vigorous growth and generally healthy appearance are strong arguments in favour of the Portuguese method. This great difference of opinion between French and Portuguese authorities is very interesting, especially to us in Australia, and has been a complete surprise to me. I am collecting all the evidence I can on the subject and on my return to France I intend to obtain further information from the leading French authorities on the whole question.

The season at which the Portuguese perform their grafting is very different to what one is usually accustomed. French authorities recommend grafting in the vineyard only when the sap is in movement or immediately before it commences to rise. In Portugal, however, the vines are grafted long before this. Grafting is commenced as early as January (July in Australia) and continues until early spring. February is looked upon as the best month by most of those I have questioned on the subject. Sometimes autumn grafting is practised; the scion knits, but remains dormant until the following spring when it makes an early start and very vigorous growth. Autumn grafting is not practised to nearly the same extent as spring grafting.

The kind of graft chiefly used is the ordinary cleft; sometimes also a shouldered cleft. A side cleft graft is occasionally used. The different systems seem to all give good results.

Portuguese authorities divide their country, from a viticultural point of view, into thirteen districts, each of which presents marked differences as regards the type of wine produced, the varieties cultivated and cultural or winemaking methods.

Such a very thorough grouping would only lead to confusion and for present purposes we may roughly divide Portugal into four principal viticultural regions—

1. The Minho or Northern District.
2. The Douro or Port District.
3. The Lisbon District.
4. The Algarve or Southern District.

These different districts can be more conveniently dealt with separately.

THE MINHO OR NORTHERN DISTRICT.

This embraces the whole of the north of Portugal until the Douro region is reached. Though most interesting and very different from the rest of Portugal, I did not think the conditions here were sufficiently similar to Australian ones to justify my spending any of my limited time in it. Besides there is nothing to be learnt here so far as reconstitution is concerned. The chief peculiarities of the district may be briefly reviewed as follows:—

The soil is chiefly decomposed granite; it is very deep.

The type of wine produced is quite different to anything we know in Australia. It is a very light, dry, red wine, rich in fixed acids and tannin, which would probably be unsaleable in Australia, either for home consumption or exportation. This wine, known as Vinho Verde or Green Wine, is much appreciated in Portugal and is also exported to Brazil and other parts of South America. The varieties from which it is made are special to the district; amongst them may be mentioned the Rabigato and Gouveio.

The method of training the vines is quite different to anything one sees in Australia. They are either trained on trees or on high overhead trellises known as "Remadas." Property is very much subdivided on the Minho and vineyards are not such as we are accustomed to. They usually consist of odd vines of very large size growing amongst mixed crops of different kinds—a regular vineyard is the exception. These vines trained on trees and "Remadas" are very picturesque and bear heavy crops but, of course, are only suited for the production of wines of low alcoholic strength such as these green wines.

A striking fact about viticulture in this region is that, so far, phylloxera has done little or no damage.

This is attributed to two causes:—Firstly, the nature of the soil. It is generally observed that vines take longer to die in deep loose soils than in those of a more compact nature. In these deep granitic soils the action of phylloxera is very slow.

Secondly, to the method of training the vine. It is well known throughout Europe that very large vines, such as the trellises round a house or a cellar, possess, in a marked degree, the power of resisting phylloxera. One sees examples of this everywhere. Frequently they continue to thrive after the small vines in their neighbourhood have been destroyed for many years.

These two factors appear to have permitted the vines of the Minho to resist phylloxera. I saw vines near Regoa and Penafiel, on the borders of the Minho and Douro districts, growing in granitic soil and trained on trees, &c., in the Minho style, which showed no signs of disease though the Port Wine vineyards only a few miles away have long since been reconstituted.

THE DOURO OR PORT WINE DISTRICT.

This certainly is the most interesting wine district of Portugal. Port is not grown near Oporto, though it owes its name to that town, but a good many miles up the river from it.

It is not until one reaches Regoa, some 50 miles from Oporto, that one enters the Alto Douro district. This is not a regular district in the strict sense of the term. It is the name given, in viticultural circles, to the limited stretch of country where the high class Ports are grown. It consists of the valley of the Douro from the town of Regoa to near the Spanish frontier and includes portions of the valleys of several of its tributaries such as the Corgo, Pinhao, Tua and some smaller rivers. It includes parts of the Provinces of Tras-os-Montes and Beira Alta. Its chief centres are the small towns or rather villages of Regoa, Pinhao (pronounced Pin-yung) and Tua. From these the port wine used in old days to be sent down the river to Villa Nova in barges. It is now usually sent more safely by train.

The vine land is limited in extent for the Douro differs from most rivers in not having any flats or level land of any kind along its banks. From the bed of the river the ground rises in steep rocky slopes to the tops of the hills at a height of often 1,000 feet above the level of the river. Its tributaries are, like it, shut in by steep hillsides rising abruptly from high water level. The vines are cultivated on terraces which rise tier upon tier giving the whole district a most characteristic appearance. Above a certain height (400 or 500 feet) vines are not cultivated. The hilltops are covered with stunted scrub where goats and sheep are grazed. Above a certain level the quality of the wine seems to fall off. There is an old Portuguese saying that no good wine is produced beyond where one can hear the creaking of the "espadellas"—the immense rudders by means of which it is possible to steer over the rapids the barges by which the wine used, in old days, to be sent down the river to Villa Nova. It is on these rather narrow bands of land on each side of the river that the wines which have made "Port" a household word throughout the English speaking world are produced. Formerly the whole of the lower hillsides were covered with vineyards. Now the scene is a depressing one as viewed from the train or river. Though one sees many vineyards and some very large ones, most of the hillsides are covered with scrub which is growing over the crumbling terraces which once were occupied by prosperous vineyards. This widespread devastation is the result of phylloxera, which in this dry warm climate and porous soil, spread with extraordinary rapidity. Though now reconstituted and producing nearly as much wine as formerly, the area under vines is considerably less than it was.

The new vineyards are better planted on ground more carefully prepared than the old ones so that from a smaller area an almost equal quantity of wine is now obtained. This desolate appearance of a once flourishing and prosperous country at once strikes the visitor. The ruin

wrought by phylloxera is apparent on every side. Numerous families who derived a comfortable income from their vineyards, so long as these continued to produce, had not the necessary capital or credit to face the heavy cost of reconstitution, and have been utterly ruined. The work people dependent on these vineyards for their livelihood feel the change and there is much poverty on the Douro. The cost of reconstitution here is very heavy. Competent authorities assure me that the cost of subsoiling, terracing, planting and grafting the land necessary for 1,000 vines amounts as a rule to £100.

CLIMATE AND SOIL.—As regards climate the Alto Douro is drier and hotter than Oporto and is very similar to Northern Victoria—especially the Goulburn Valley. I have secured rainfall and temperature records which show this similarity. Corroborative evidence of it is to be found in the way in which Australian indigenous trees prosper. Thousands of eucalypts, chiefly blue gums (*E. globulus*), have been planted along the railway line; these do quite as well as in Victoria in marked contrast to their behaviour near Montpellier (France) where they are frequently cut down by severe winter frost. Acacias also do well; our common blackwood is frequently to be seen, and is known under the common name of "Australia." A good many blackwoods in dry situations succumbed to last year's drought. Several wattles also do well in moister situations, notably the silver wattle.

The soil of the Alto Douro is very striking and quite different to that of the country surrounding it. The greater part of Northern Portugal is granitic and from Regoa to its mouth the Douro runs mostly between huge granite boulders. Along the railway line from Oporto to Regoa the country is mostly granitic though there are patches of auriferous land which were worked for gold in the time of the Romans. The Alto Douro wine district however is entirely composed of schistose slate, easily broken up and which disintegrates into a fairly fertile soil. This schistose rock is of a fibrous, silky, semi-crystalline texture very striking in appearance. In many places schistose and granitic formations occur side by side. It is a notable fact that no good port is ever grown on granitic soil. Where these occur on the Douro light table wines are produced. Port is only grown on schistose soil. Some of the rock near the Rutherglen Viticultural College is similar in appearance and texture to the schists of the Alto Douro though it is darker and especially redder in colour.

From a chemical point of view, the most important feature in connexion with these soils is their freedom from excess of lime. As a rule, throughout Portugal vinegrowers seldom have their reconstitution troubled by excess of lime in the soil.

SUBSOILING.—This is carried out to a truly extraordinary depth. Had I not seen several places where the work was last discontinued, I could not have believed that the soil was generally prepared to such an extreme depth. I have seen places where subsoiling has been regularly carried out to a depth of 8 and even 10 feet. The soft rock is broken down with crowbars and smashed into fairly small pieces which gradually weather into soil. This depth is certainly not the average. In this case the rock was practically on the surface: there being scarcely any soil to mix with it, extra deep preparation was deemed necessary; but land is seldom planted with vines on these dry, stony hillsides, where

the drainage is excessive, unless the ground has been first broken up to a depth of 5 or 6 feet. It has been found futile to plant American vines on the Douro, unless this deep preliminary cultivation is thoroughly carried out.

VARIETIES CULTIVATED.—Unlike Burgundy and Hermitage, in each of which districts one variety alone is cultivated, or Bordeaux where one (the Cabernet Sauvignon) forms the basis of all the best vineyards, Port is made from a large number of distinct "cepages" differing widely from one another in such important matters as the colour, body, &c., of the wine made from them. Some of these sorts predominate in one vineyard and some in another, yet the wines of different vineyards do not differ so greatly as one might expect. They are further equalized afterwards, and it is largely owing to the skill with which the merchant blends and handles the wines of different vineyards that the uniformity of high class Port, turned out by any of the well-known firms, is due.

If any one variety is more generally prevalent in all the different Douro vineyards it is probably the Touriga, though one meets almost as frequently with the following kinds:—Tinta Cao, Tinta Amarello, Mourisco Preto, and Alvarelhao, in varying proportions. The following additional sorts are also to be met with in many vineyards, and are considered, together with those already mentioned, among the best Port varieties:—Bastardo, Souzao, Donzellinho do Castello, Tinto Carvalho, Tinta Francisca, Tinta Roriz, and Cornifesto. The above are all red varieties; White Port is chiefly made from the Codega or Malvasia Grossa and Malvasia Rey. These last two are white grapes. No Muscat is ever mixed with the above in the making of Port Wine. The Muscat flavour is quite foreign to Port, and would destroy its character. The well-known bouquet and flavour of Port seem to be solely due to the varieties above named, and to the unique soil in which they are grown. In some vineyards a certain area of Muscat grapes is grown, but the wine from these is always made separately. It usually finds its way to Brazil, where there is a regular demand for this type of wine.

Some very fine table grapes are also grown on the Douro, notably, the Formosa, and several varieties of Ferral. The Mourisco Preto, mentioned above as a wine grape, is, strange to say, also a good table grape. Another peculiarity it possesses is a partial resistance to phylloxera—too slight, however, to be of any practical use.

METHODS OF PRUNING, TRAINING, AND CULTIVATION.—The distance apart of the vines varies greatly, depending a good deal on the width of the terraces, which in turn depend on the slope of the hill. As a rule, the rows follow the direction of the terrace, the vines being about 4 ft. apart in the row. Where the terraces are narrow, there are two rows of vines, or sometimes even only one, on a terrace, but where these are wide enough the vines are planted more regularly, the rows being from 6 ft. to 8 ft. apart. The vines are long pruned one, two, and even three rods being left on a vine, according to its strength. Usually a few spurs are left as well, but the "Guyot method" does not seem to be regularly practised. The rods are generally bent round and supported by small stakes or bamboos—as many as six of these are sometimes allowed to one vine. They are in many cases only pine twigs, or anything else that comes handy, for wood is scarce and expensive in Portugal. Some growers are now training their vines on wire. In a good

many cases slate posts are used, about 2 x 4 inches in section. These look very neat, and are strong and practically indestructible. At first sight they look very like wood, and one wonders at wires being supported on such light pieces of timber. These slate posts are quarried at Pocinho, higher up the river, and cost from 5d. to 6d. each. The vines are not tied up in the summer, but care is taken to arrange the shoots, when disbudding, so as to shelter the fruit from the sun as much as possible.

Cultivation is very thorough, and is all done by hand. The first, or deep cultivation, corresponding to our winter ploughing, is termed in Portuguese "Cava." The ground is thoroughly turned to a depth of nearly a foot. Sometimes the land is gathered up into ridges, so that the whole of the rainfall may sink into the subsoil, and none be allowed to run to waste. This "Cava" is executed with the hoe during February and March. The trunk of the vine is bared, so that any roots thrown by the scion may be thoroughly removed. "Cava" is the heaviest work in the vineyard; it, as well as subsoiling (Rotiamento in Portuguese) is usually performed by gangs of Gallegos, or men from the adjoining Spanish province of Galicia. The Portuguese inhabitants of the Douro prefer the lighter ordinary work. The second cultivation is known as Redra. It consists in a light stirring and levelling of the soil with the hoe. It is done by the people of the district during May or June. Should weeds be troublesome, a Secunda Redra is carried out later in the season, but in the hot and dry Douro summer it is not, as a rule, necessary.

The vineyards I saw struck me as being remarkably clean and well cultivated. A few vines were suffering from sunburn, but last summer was hotter and drier than usual. The rainfall on the upper Douro from 1st January, 1907, to 30th September, 1907, only amounted to 9.68 inches, of which nearly 2 inches fell in September, just in time to save the crop from failure.

The healthy state of the vines and their resistance to drought is no doubt due to the great depth of the preliminary preparation of the soil in the first place, and in the second to the thorough and deep winter cultivation.

RECONSTITUTION ON THE DOURO.—Phylloxera made its appearance in Portugal nearly thirty years ago, the Douro being one of the first districts attacked. It spread with astonishing rapidity, and in a few years the whole district was practically destroyed. The example of one vineyard —Quinta de Roriz—will serve to show the rapidity with which the pest spread in this porous, rocky soil. The last four vintages yielded by this vineyard (about 90 acres in extent), prior to its total destruction, were respectively as follows:—140 pipes, 60 pipes, 10 pipes, and 6 pipes. The Portuguese Government and private growers turned to France for advice. That country had by this time replanted large areas on resistant stocks, and French growers were beginning to find out the faults of the stocks first used, such as Taylor, York's Madeira, Jacquez, &c. It was the commencement of the Riparia period. This stock was thus planted extensively on the Douro, and, strange to say, it has on the whole, given satisfactory results; far more so than I expected from what I had seen of it in the south of France. Whether it is the very deep preparation of the soil, or the freedom from excess of lime, it is hard to say; no doubt both these points are in its favour, but Riparia, grafted with the usual Douro varieties, and pruned long, is, even after twenty years, still giving satisfactory results in many of the Douro vineyards. Rupestris du Lot

is also a good deal used, though it is complained that some varieties set their fruit badly when grafted on it.

Nevertheless, the tendency now is to replace these two stocks by newer ones, notably, by 3309, which is being very largely used in all the recent plantations, and in almost every case is giving great satisfaction. One exception must, however, be recorded, that of Mr. Christiano van Zellar, owner of Quinta de Roriz, who informs me that he has been disappointed with 3309. He complains that it does not make sufficient growth in its first few years, and that on the whole he prefers the old Riparia to any other stock. His opinion is not shared by his neighbours, and it is the first time in my travels that I have heard 3309 unfavorably spoken of. The Franco-Americans have not been extensively tried on the Douro. A.R.G.1 is more used than any of the others, and has been found satisfactory. I cannot hear of a case where its resistance to phylloxera has been questioned; 1202 has not been tried to any extent.

Some growers are trying the Berlandieri and its hybrids on account of their drought resisting power. The pure Berlandieri can only be propagated, by cuttings, with great difficulty. I saw an interesting example of propagation of this species—by means of multiple layering—in the private nurseries of Messrs. Offley, Cramp, and Forrester. At Quinta de Roriz I also saw a good many 5-year-old grafts on 420A (Berlandieri Riparia) which were doing very well. These newer stocks, though very promising, are of too recent introduction into Portugal for it to be possible to form an exact idea as to their value.

The resistant stocks are usually struck in Oporto. The rainfall being much heavier there, better growth is thus insured. Some growers think it would better to raise the young vines in the same locality, where they are to be planted permanently, but the Oporto-raised rootlings seem to give quite satisfactory results, and are very generally used. As has already been stated, these vines are nowadays always planted ungrafted in the vineyard, and only grafted when they have made sufficient growth to stand the operation. In the dry Douro climate and excessively drained terrace land, strong rooted vines are exclusively planted. Anything else, as a rule, dies during the dry summer months, no water being available for irrigation. The depth at which the vines are planted varies considerably, opinions differing much on the subject. At one of the leading vineyards they are planted 3 ft. deep. The length of the original cuttings, when planted in the nursery, is about 15 inches; these are not brought to the vineyard until they have made a strong shoot several feet long. In this way it is possible to plant the young vine with the butt of the original cutting as deep as 3 feet, and even more, below the surface of the soil. On the vineyard in question this very deep planting is now exclusively used, it having been found to give the best results. On this same vineyard plantation with grafted rooted vines was also tried extensively, but the system has been abandoned as inferior to vineyard grafting. This very deep planting is not, however, always practised—many growers consider a depth of about 18 inches sufficient. Both systems seem to give satisfactory results; it is largely a question of the dryness of the land.

When the vines are sufficiently strong they are grafted, the ordinary cleft being the graft usually employed. February (corresponding to August in Australia) is the best month for this operation, though it is frequently commenced as early as January. In some vineyards autumn grafting is favoured, the work being done before the fall of the leaves. The scion knits immediately, but remains dormant; during the winter it

is marked by the high mound of soil which covers it. Care must be taken that the different cultural operations do not interfere with the young graft. Though some growers strongly recommend autumn grafting it is not very generally practised. Spring grafting is far more common.

WINE MAKING ON THE DOURO.—To completely describe this would need a special report. At this stage it will be sufficient to briefly outline the principal points of importance.

The varieties employed have already been dealt with.

The maturity of the grapes is not allowed to proceed so far as might be thought necessary for a sweet wine.

The grapes must be quite ripe, but not over ripe. In this Port differs from most other sweet wines of high quality.

The grapes are brought straight from the vineyard to the "Lagar," or fermenting house, and go through no extra ripening process of any kind. The must of those I saw being crushed varied between 11 and 12 degrees Beaume (1.081 to 1.089 specific gravity). This is rather lower than usual, late rains having swollen the fruit. Last year I am told that it was a high as 14 degrees Beaume, and last year's was quite a good vintage. It seems that the must from which Port is made seldom has a higher gravity than 15 deg. Beaume (1.114 sp. gr.). Very over-ripe grapes have an unfavorable influence on the stability of the colour, an important point, especially for Vintage Ports. The difference between Vintage and Tawny Ports will be dealt with later. The making of both at vintage time is the same.

Rain during vintage is much dreaded, as it is liable to cause the grapes to rot. Faulty, and especially mouldy or rotten grapes produce a very inferior wine the colour of which gives much trouble.

The question of the removal of the stalks is one on which wine-makers do not agree. At one of the best vineyards I visited, all stalks were removed with a stemmer of French make (Egrappoir) similar to the ones we use in Victoria. In another vineyard, famed for the quality of its wine, the stalks were not removed at all, and in others varying proportions of the stalks were taken out by means of a large meshed riddle.

The grapes, whether stemmed or not, are placed in large, shallow, stone fermenting vats known as " Lagars" in which they are trampled on at intervals during the whole of the fermentation by gangs of barefooted men. These "Lagars" vary in size. They are usually about 15 ft. x 15 ft. x 2 ft. deep. As a rule, they hold enough grapes to yield from 15 to 18 pipes of wine. (The pipe contains about 120 gals.).

The first trampling, known as "breaking the lagar," is hard work, especially if the grapes have not been stemmed. It is carried out by at least 20 men, who trample or dance on the grapes for four hours until they are reduced to a uniform pulp, which fills the lagar to a depth of a little over the men's knees. Subsequent tramplings are carried out in spells of from four to six hours at a time, separated by intervals of rest of similar duration. This goes on for the whole of the time the grapes remain in the "lagar," usually from three to four days. This "work," as it is termed, is held to be essential for the quality of the wine. It is not desirable that fermentation should be too active, as this would cause the wine to become dry before it could have received what is considered a proper amount of work. No hard and fast rule can be laid down, but lagars seldom receive less than twenty-four hours' work in intermittent spells.

When fermentation has proceeded far enough the "lagar" is run off and further fermentation checked by the addition to the liquid part of a sufficient quantity of spirit. The marc is pressed in the usual way, but the wine obtained from the press is kept separate and considered to be of inferior quality. Owing to the amount of trampling the grapes have received, the juice is very readily separated from the marc; the proportion of "press wine" does not amount to more than 10 per cent. of the first quality wine. It is remarkable how small a press can deal with the marc from one of these large lagars.

The point at which fermentation should be stopped is another matter, concerning which opinions differ. Sometimes it is done when the gravity is as high as 6 deg. Beaume, and sometimes when this has fallen to 2 deg., and even less, the resulting wine being, of course, sweeter or drier. There is no fixed rule.

These wines of different degrees of sweetness are afterwards blended by the merchants to one even type. "Geropega" is sometimes made by the fortification of the juice of very ripe grapes which have only fermented to a slight extent. Portuguese "Geropega" is never made by boiling or concentrating the must in any artificial way. It is thus very different from the "Arrope" of Malaga. The use of Geropega is rather exceptional, and the quantity of it made is very limited. It is only used to increase the sweetness of an old wine, should such be found necessary. It is not a regular constituent of Port. The addition of the spirit to the wine is very simply carried out. The new wine runs from the "lagar" through a channel cut in the stone floor to the "tonnel" or large cask, in which it is to be stored; the "adega," where these tonneis are kept, being on a lower level than the lagar. The spirit is syphoned from pipes directly into the stream of wine in this stone channel. In this way an effectual mixing of the two seems to be obtained. The quantity of spirit to be used is arrived at without the use of any instrument beyond the saccharometer. Enough is added to stop fermentation and to bring the strength of the wine to about 29 per cent. or 30 per cent. (proof spirit). A second addition of spirit is made when the wine is taken to Villa Nova during the winter, and the third and usually the final one at the subsequent racking. It brings the strength to 37 or 38 per cent. proof, the usual strength of Port; though even this is not an absolute rule, Ports of other strengths being sometimes met with.

The spirit used in fortifying Port is a matter of vital importance, and has a considerable bearing on the character and bouquet of the wine. On the best Douro vineyards a highly rectified silent spirit is never used—only a spirit distilled at fairly low strength, and which retains a good deal of the flavour of the wine from which it is made. Its strength when added to the wine is usually 37 per cent. over-proof. This spirit is often distilled in a pot still, and can, of course, only be made from sound wine. When one remembers the low original gravity of the must and the high alcoholic strength of the finished wine, it is evident that roughly one-half of the alcohol contained in Port consists of added spirit. The type of spirit used, and the fact that it is not silent spirit, are points of great interest. The flavour of this spirit (for it has, even when young, quite a pronounced character) has, no doubt, much to do with the character of the finished wine. It is noteworthy that this special spirit is only used for high-class wines, which take a long time to mature. It must be added to the wine a long time before the latter goes into consumption. For

cheap wines, which are to be consumed young, or for slightly increasing the strength of an old, matured wine, should such prove necessary, silent spirit, highly rectified, is used.

The merchants of Oporto are most particular in selecting their fortifying spirit. It is really only second in importance to the grapes from which the wine is made. This spirit is, and has been for many years, exclusively made from wine. Recent Portuguese legislation has rendered this compulsory, but even before the new law came into force wine spirit was always used for the best wines since other kinds would not contain those elements which seem to be necessary for the production of the true Port character.

White Ports.—These are little known in Australia or in England. The chief demand for them is in Russia. They are made from white grapes, and though grown on the same vineyards, and treated in the same way as the red wines they differ very considerably in bouquet and character. We might possibly find a market for this type of wine in Siberia *via* Vladivostock.

Vintage Ports and Tawny Ports.—These are the two classes into which Ports may be divided. Though made in the same way at vintage time, they differ radically in their after treatment. Tawny Port is matured in wood, whereas Vintage Ports are bottled early (at two or three years old, as a rule) and matured in bottle. The difference between the two in colour, bouquet and flavour is striking and well known to connoisseurs of Port. A vintage wine, as its name indicates, is always the produce of a single vintage. It is only special vintages when quality is above the average, which are sold as Vintage Port. Tawny Port, on the other hand, is kept in wood for an exceedingly long time. It is not the produce of one, but of a number of vintages, the blending of which in order to keep up a constant and even quality of any particular proprietary brand, constitutes the chief art of the skilful Port Wine merchant. Far from deteriorating from the addition of younger wine, it is considered that a very old Tawny Port gains by being from time to time "refreshed" in this way. Their treatment is somewhat after the style of the sherry "soleras," though there is a considerable difference between the two. In Tawny Port a slight taste of the oak wood of the casks is noticeable, which is characteristic, in the same way as it is of old French brandy. One requires to be very careful, however, that this taste is not too pronounced; in such a case the wine would be "woody."

The seasoning of the casks is thus a very important matter. After it comes to Villa Nova, Port is, almost exclusively, handled in pipes. Those made of Baltic oak are preferred. Many merchants claim that American oak gives a distinct and objectionable flavour to wine and will not use this timber on any account. They say no amount of seasoning will render it fit to hold a fine Port Wine.

The seasoning of the pipes, even when they are made of Baltic oak, is very thorough. After steaming and water seasoning for a variable time, they are filled with cheap wine which remains in them for some months. It is only casks thus seasoned with common wine that are used for high-class Ports. There is another process of seasoning with ammonia and steam, which is said to remove the taste even from American oak, but the majority of merchants prefer the older method. Many armazens or lodges have their own cooperage attached to them. The coopers are paid by piece work.

As regards ordinary cellar manipulations there is little to report. The best Ports are matured in pipes of about 120 gallons each, stacked in tiers 3 and 4 high. These are kept full and during the first few years they are racked off their lees once a year.

Such is a very brief sketch of the making and maturing of Port. It will be observed that with the exception of the addition of spirit, it is an absolutely pure, natural wine, owing its character and qualities to the soil, the climate and the "cepages" or varieties of vine grown. From what I have seen I am of opinion that in Victoria we should be able to produce high-class wines of a "Port" type. We have the soil—I know several localities where the land much resembles the schists of the Douro. We also have the climate. The Douro "cepages," however, have not, as yet, been introduced into Victoria. In my opinion their introduction is very desirable for the improvement of our wines of a Port type.

THE LISBON DISTRICT.

This includes several regions where local cultural methods prevail and distinct types of wine are made, such as Collares, a light dry red wine; Bucellas, a Portuguese Hock; Carcavellos, somewhat after the style of Sherry. Torres Vedras produces full bodied dry red table and blending wines; near Pinhal Novo, across the Tagus, and about 20 miles from Lisbon is the enormous vineyard of Rio Frio, with over 9,000 acres under vines. Some of these are very curious; Collares, for example, where ungrafted European vines are planted in pure sea sand at a depth varying between 10 and 20 feet! Collares wine is light and agreeable and held in great esteem by the Portuguese who compare it to a French Claret, though it reminds one much more of Beaujolais. At Torres Vedras, and in its neighbourhood are large areas under vines reconstituted some years ago producing large quantities of a dry red wine of full body and colour, not unlike some of our Victorian red wines.

Most of these localities cultivate their own special "cepages." At Collares the Ramisco is almost exclusively grown. The Arintho is the chief Bucellas variety, Gallego Dorado and Trincadeira, yield the wine known as Carcavellos. At Torres Vedras the Jao Santarem and Trincadeira are largely cultivated, whilst at Almeirim, Pinhal Novo and other places south-east of the Tagus one finds such kinds as Trincadeira, Castellao, Fernao Pires, Roupeiro, &c. Portugal is very rich in different varieties of vines. The above are the principal wine varieties grown in the neighbourhood of Lisbon.

Several fine table grapes are also largely cultivated, chief amongst which we have Formosa and Diagalves (some authorities consider these to be identical). These are good carrying sorts; considerable quantities are shipped to England and elsewhere during the season. The Boal, of which there are several varieties, also deserves mention. There are several other fine table grapes less largely cultivated. A fine Muscatel, known as *Muscatel de Jesus*, is also largely grown. It is very like the Gordo Blanco, but Portuguese authorities tell me it is not the same. They consider it to be superior. Without seeing the two growing side by side it is not possible to decide this point.

RECONSTITUTION.—Near Lisbon many different geological formations occur. Tertiary sandstones are very common. One also sees basalt here and there and occasionally limestone and granite. The vineyards are

chiefly planted in sandy loams, the proportion of sand varying very considerably. I referred, in a letter, to the large number of ungrafted vineyards which have been planted in sandy soils near Lisbon. Unless the soil be very sandy, European vines do not resist, and in all the richer loams the vineyards are grafted on resistant stocks, which do remarkably well. In these deep sandy loams almost any American will thrive; reconstitution has consequently been a great success about here.

Riparia was much planted in the early days and where the soil is deep and moist it is still giving satisfaction. On hillsides it is not so suitable as Riparia x Rupestris hybrids, and in some cases Rupestris du Lot is preferred, though there are complaints of faulty setting of the fruit on this last-named stock.

Several Franco-Americans are used on the hill sides, where they do better than Riparia. Growers are very well satisfied with them, especially with A.R.G. 1. No. 1202 has not been used to nearly the same extent but those who have tried it are satisfied with it. No. 601 (Bourrisquou x Rupestris) is highly spoken of for dry hillsides near Torres Vedras. I was not able to hear of a single case where the resistance to phylloxera of the above-mentioned Franco-Americans was not amply sufficient.

On one vineyard I saw a curious case of the value of the Solonis in a special soil. This stock is now generally discarded on account of the short life of the vines grafted on it. Usually after a few years they lose vigour and die off altogether. The lower portion of the vineyard in question, on the edge of a creek, is wet and liable to floods. In this special, almost swampy soil, a block of vines, grafted on Solonis, and over 20 years old, is still vigorous and healthy and produces a good crop of grapes. Such a case is unusual and is only mentioned as showing how limited an area some stocks may prove useful in.

As regards the establishment of the vineyard, much that I have written concerning the Douro applies also to the Lisbon district, though in the latter the land is usually a gentle slope where terracing is not necessary. The chief difference is in connexion with subsoiling, which is not carried to anything like the same depth. As a rule this varies between 2 and 3 feet near Lisbon. In rich, loamy land 2 feet is considered sufficient, whilst poor sandy soils are turned over to a depth of 3 feet. The extremely deep working at Collares is a purely local exception. The rooted American vines are not planted so deep as on the Douro—15 to 18 inches is the usual depth.

Here also, vineyard grafting is everywhere the rule. Those who have tried planting bench grafted nursery struck vines have given it up in favour of vineyard grafting. The ordinary cleft graft is the one chiefly used. It is performed in February. None of the growers I met here was in favour of autumn grafting.

The distance apart of the vines is usually 5 ft. x 5 ft., though I saw some vineyards at 5 ft. x 3 ft. 3 in., and at 7 ft. x 3 ft. Even at these distances the vineyards are all worked with the hoe.

The unsuitability of very sandy soil for the life of phylloxera is one of the most interesting facts which strike a visitor to the vineyards near Lisbon. The climate here is very suitable for the spread of phylloxera. At Torres Vedras its action was most rapid and the vineyards on rich land were destroyed within an exceedingly short space of time. Yet one finds large areas where vineyard owners are even now planting ungrafted vines. Wherever the soil is sufficiently sandy, phylloxera seems powerless to do any harm.

In the almost pure sea sand of Collares this might be expected: but many of these resistant vineyards are planted on soil which is far from being pure sand. Near Almeirim it was possible to study the different degrees of resistance. One could see in the same neighbourhood, soils where it has been necessary to replant resistant vines, as well as soils where the old Europeans can be grown ungrafted.

In some, which may be termed intermediate soils, the vines die very slowly. They continue to produce small crops. However, the yield suffers to such an extent that most of this land has now been replanted with grafted vines. One large proprietor near Almeirim owns large areas of sandy soil. For many years past he has planted a certain area of fresh land with ungrafted vines each year. He considered that in his soil it would take at least 15 years for the phylloxera to seriously damage his vines. He looked upon this period as a sufficient one during which to obtain returns and was prepared to root out his 15-year-old vines and to replace them with other cultures, thus making viticulture enter into a rather extended rotation system. Though his first vines were planted over 20 years ago they still resist. There can be no doubt about the prevalence of phylloxera right through his vineyard, for wherever a patch of less sandy soil occurs the vines have succumbed.

Near Pinhal Novo, about 20 miles from Lisbon, is the enormous vineyard of Rio Frio with its 9,000 acres of vines in a single block 8 kilometres long by 5 wide. The soil is very sandy, and the greater part of this consists of ungrafted Portuguese varieties on their own roots, chiefly Trincadeira, Jao Santarem and Castellao. The owner and founder of this vineyard commenced planting when phylloxera invaded the other districts of Portugal. He also, counted on getting 15 or 20 years' profit out of his vines. After a few years in one part of the vineyard, he planted cork oaks among his vines with the idea that by the time phylloxera became troublesome he would have a cork oak plantation fit to strip. Contrary to his expectations, after 20 years the oldest vines were still doing well, so he cut the cork oaks back severely so as to give his vines a chance for another 10 years or so. Even at Rio Frio, however, the owner is now of opinion that it is safer to plant Americans and graft them. Now that cuttings of resistant stocks are cheaper than they used to be he makes his new plantations on resistant stocks. The portion of his property he is now planting is perhaps rather less sandy than the part first planted. A complete description of Rio Frio and its enormous winery and distillery must be held over for the present.

The question of plantation in sandy soils is one of interest to us in Australia, for we have large areas where ungrafted European vines will, in all probability, be able to resist phylloxera. I have secured samples of soils from near Lisbon, both completely and partially resistant, for comparison with some of our sandy soils on my return.

The production of fortifying spirit is a very important industry in this part of Portugal. Most of the spirit used in the fortification of the Ports grown on the Douro comes from near Lisbon. Some years ago it was not unusual for Lisbon wine to be shipped to Oporto, thence to be reshipped as Port. The small Douro vinegrowers complained bitterly and at their request, the Government prohibited the shipment to Oporto of wine from other places. In order to placate the growers round Lisbon they prohibited the distillation of spirit on the Douro. The Oporto merchants are thus compelled to buy their fortifying spirit in Southern Portugal. A large quantity is also required for the fortification of the alcoholic

wines grown near Lisbon, such as the so-called "Lisbon Ports," Carcavellos, Muscat, &c. These wines usually go into consumption early. They are chiefly fortified with highly rectified, silent spirit.

THE ALGARVE DISTRICT.

This consists of the extreme south of Portugal, where the climate is hot and dry. As phylloxera has only recently made its appearance in this part of the country there is not much to be learnt there in connexion with reconstitution. I did not therefore consider it advisable to devote any of my remaining time to visiting this region, though I understand there is much of interest to be seen in it. Strong fortified wines and also heavy dry reds are made and raisins are dried to some extent. I am told that figs, olives and carob beans are largely cultivated.

* * * * *

The above is a brief sketch of some of the main points of viticultural interest which strike one in a hurried visit to Portugal.

So far as reconstitution is concerned the most important conclusions to be drawn are as follow:—

1. That Portuguese vinegrowers have adopted the resistant stocks raised in France, most of which have given highly satisfactory results.

2. That the absence of excess of lime (in the soil) has simplified problems of Portuguese reconstitution. Similarity of Australian soils in this respect should render the experience of Portugal very encouraging to our viticulturists.

3. That in Portugal the system of planting resistant stocks in the vineyard and grafting them after they have become thoroughly established is universally preferred to planting bench grafted, nursery reared vines.

4. That not only in pure sand, but also in some sandy soils, ungrafted European vines can be profitably cultivated in spite of the presence of phylloxera.

THE ORCHARD.

James Lang, Harcourt.

The weather still continues very dry, and if rain does not soon fall, the late apples will not be as satisfactory in regard to size as they gave promise of some time ago; a break of the dry weather may, however, occur at any time. On account of the excessive heat the present summer has been a peculiarly trying one; a good deal of the fruit has been scorched on the trees, and the growth has not been as satisfactory as it might have been. Another spraying for Codlin Moth should be given at once, as a late brood of the moths is now hatching out; this spraying will also help to keep the late apples clean. Many growers complain that spraying has not been so effective this year as last. This may be accounted for by the very light crop of apples in most orchards. With a light crop, spraying is much more difficult than when the trees are bearing good crops, because the foliage covers most of the young fruit, especially when it is very small, so that in many cases the spray does not reach it. Another cause of the apparent increase of grubs is that a light crop shows a much larger percentage of infected fruit than a heavy crop does, although the total quantity of grubs may be considerably less.

Bitter pit is not so much in evidence this season as usual. This may perhaps be owing to the very dry spring and summer. Last year we had an excessively wet spring and summer, and the season was one of the worst for bitter pit the writer has known. This may point to the fact that climatic influence has a good deal to do with the appearance of bitter pit. It will take a few years' observation to say whether the theory is correct or not. Mr. McAlpine, vegetable pathologist, recommends half a bushel of air-slacked lime to trees that are effected with bitter pit, the lime to be spread evenly over the surface of the ground as far as the branches extend.

The export of apples will not be so large this year as it was last; still there is likely to be a fairly large quantity of all the leading kinds shipped. A fair quantity of pears should also be tried; last year the pears turned out uncommonly well. The shipping companies are now making better provision for carrying this class of fruit in cool chambers, separate from the apples, and at a much lower temperature. Mr. J. B. Thomas, fruit broker, of Covent Garden, London, who has just paid a visit to Victoria, says that pears will always command high prices in London, provided that they are landed in good condition. He hopes to see the time when the earlier pears, such as William's Bon Chrêtien, will be shipped in large quantities, and he feels sure that the prices they will realize will be very remunerative to the growers.

Budding may still be done, provided the bark of the stocks runs easily. A good soaking of water, two days before budding is done, will put the stock in good condition for the operation.

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DISEASES OF FARM ANIMALS.

(*Continued from page 160.*)

S. S. Cameron, M.R.C.V.S., Chief Veterinary Officer.

VII.—ACCIDENTS AND INJURIES (*continued*).

ABRASIONS, BRUISES, CONTUSIONS, AND ABSCESSES.

An ABRASION is an injury on the surface of the skin without rupture. Sore shoulders are a common instance of abrasion in horses (see next page).

BRUISES are injuries of the nature of a wound sustained beneath the skin without breaking of the surface. Saddle and girth galls partake of the nature of a bruise.

The term "*contusion*" is usually applied to a deep seated bruise or to an injury of the substance of an internal organ without rupture of its covering.

An ABSCESS is a closed cavity in tissue enclosing a collection of pus. It is formed as a result of a circumscribed suppurative inflammation and has a tendency to increase in size—always in the direction of least resistance, hence the "pointing" of abscesses towards the skin or soft structures. Abscesses may be *caused* in a variety of ways, as from bruises or fractures, but the essential causative condition is the presence of one of the common pus forming bacteria (*Staphylococcus pyogenes aureus* or *albus*). Their formation is almost always accompanied by local pain, swelling, heat and usually throbbing. The principal feature by which an abscess may be distinguished from a non-suppurative swelling is that the former is fluctuating while the latter usually "pits" on pressure. Abscesses may be "acute" or "chronic"; the former "come to a head" or "point" quickly, while the latter are slow in reaching the bursting stage and are usually surrounded by a dense wall of fibrous tissue. Fistulous withers, poll evil, shoulder tumors and the like are ordinary instances of abscess formation of varying degree and character.

Occasion is now taken to describe in detail several of the conditions just mentioned as a knowledge of their nature, and their successful treatment is often a matter of considerable economic importance to the stock-owner.

Sore Shoulders.

This is an abrasion of the skin covering that part of the shoulders in contact with the collar. Young horses, when first used in harness, and horses with delicate skins are especially subject to sore shoulders. Neglect of grooming and failure to remove the sweat and scurf from the skin after work may predispose to its occurrence; but the condition is usually brought about by the use of ill-fitting or badly stuffed collars. In the latter case the necessity for the intervention of the saddler is obvious. The regular use of astringent applications calculated to harden the skin is advantageous in young animals with tender skins. One of the most effective of such applications is a decoction of wattle bark made by boiling half a pound of wattle bark in a gallon of water. Tan liquor and brine are also useful applications which can usually be easily procured. An effective lotion for the purpose can be made by dissolving two drams each of alum and sulphuric acid in a quart of water. If the parts which are liable to chafe be freely sponged over with one of these solutions two or three times a week, they will soon become so hardened or toughened as to give little further trouble.

Treatment.—Recovery is aided by throwing the horse out of work for a time. If in mild cases this is inconvenient the part of the collar coming in contact with the abrasion should be "chambered" or it should be so padded as to prevent contact with the abraded surface. As a healing application nothing is better than the White Lotion prescribed on page 159, which should be sopped on many times during the day. If the abraded surface is very moist or "running" powdered zinc oxide or calamine should be dusted on. The keeping of the parts thoroughly clean throughout all stages of treatment is, of course, essential.

Saddle and Girth Galls.

These may take the form of an abrasion or bruise or blister caused by a pinching of the saddle cloth or girth or by the unevenly distributed pressure of a badly-fitting saddle. They are especially common on horses ridden by ladies on account of the straining of the side-saddle to one side. Sore backs are frequently caused through allowing the harness to remain on during the intervals between work, and also through failure to properly groom or cleanse the skin in contact with the saddle.

The Treatment should be similar to that recommended for sore shoulders. The saddle or harness should be so adjusted as to be kept clear of the sore and a saddle cloth of felt or Turkish towelling should be worn. The stuffing of the saddle should be attended to and care should be taken to remove all accumulations of dried sweat from the linings which must be kept scrupulously clean.

Sitfasts.

Sitfasts may occur on the shoulder or on the back near the withers but they are most frequently met with in the latter situation, where they are really aggravated saddle or harness galls.

A sitfast is an open sore in the centre of which is a hard mass consisting of dead tissue, skin, hair, and coagulated discharges firmly adherent to the subjacent living tissues. The margin of the sore is usually also hard and leathery, very angry looking and sore. They are caused by the continuous pressure of the saddle or harness on a galled spot

whereby the scab and discharges are pressed into the sore instead of being allowed to peel off. The mass of dead matter acting as a foreign body constitutes a persistent irritant and when pressed upon causes the animal great pain, as is evidenced by marked flinching and fear when the spot is touched. The dead mass corresponds in great measure to the core of a corn on the human toe; its existence has been brought about by the same cause, viz.:—pressure, and the pain which is experienced is maintained in the same way, viz.:—by the squeezing of the living tissues and nerves underneath the core between the external pressure and the underlying bone.

TREATMENT essentially consists in the removal of the core. In some cases this may be done by grasping it with strong forceps or pincers and forcibly tearing it out. It is, however, often so firmly attached that its *removal can only be effected with the knife.* Such an operation can be best performed if the animal is cast and chloroformed as the patient is usually very fidgety or vicious when the parts are being interfered with. The margin of the sore should be scarified with the knife at the same time, and the resulting wound dressed with antiseptics in the ordinary way (page 54, Vol. V.).

Fistulous Withers.

Fistulous withers are so common in Australia, and so familiar to every horseman, that the term "fistula" is by common acceptation and use applied, almost solely, to a condition of the withers of horses, varying, in succeeding and more grave stages, from a mere pinch or bruise to an utterly incurable mass of calloused and suppurating tissue the size, perhaps, of a camel's hump, with channels running through it in all directions, and opening in many places on both sides of the shoulders, back, and neck, and including extensive disease of the bones of the spine, and, perhaps, of the shoulder-blade.

Without a kowledge of the anatomy of the neck and withers it is difficult to understand why an injury which, if it occurred at almost any *other part of the body, would soon be cured, when sustained at this part* should result in such a severe way. Even the slight bruise caused by a pinch of the collar or saddle, or broken saddle-tree, may, if not properly treated, result in an incurable fistula. If, after a bruise or pinch of the withers, cooling lotions are applied, and the horse rested for a day or two, the mild inflammation soon subsides, and no ill results follow. But if the injury is *severe in the first instance,* or if a slight cause is allowed to continue to act so as to favour the formation of matter (pus), then the anatomical peculiarities of the part render a fistula inevitable. The muscles of the neck and withers are for the most part broad and flat, and are placed flatly one outside the other and side by side, running from different parts of the neck over and under the shoulder-blade on to the back. Now, when matter forms it has a tendency to gravitate, and always runs in the direction in which there is least resistance. Hence, if the bruise of the withers is at all deep-seated and sufficiently severe to result in the formation of matter, then this matter very soon burrows its way down in *the interstices between the muscles, and is there imprisoned.* *So lodged,* it never "points" through the muscles towards the surface, but remains and acts as an irritant, and sets up a productive inflammation, resulting in the formation of a callous swelling. By and by there is an effort of nature to get rid of the imprisoned matter by the formation in the calloused flesh of tubes or channels (sinuses), which run in all directions through it,

and open through the skin generally at a part higher than the seat of the imprisoned matter. From these openings a little matter is gradually discharged, but the bulk of it cannot get away (it cannot run uphill), and so the inflammation continues and spreads beyond the original seat until, perhaps, the spines of the back bone are implicated, in which case there is little hope of recovery, except in the hands of a really skilful veterinary operator.

Causes.—Fistulas are very common in Australia—so common that I have myself had to operate on as many as half-a-dozen cases in a single forenoon. I have seen three horses affected simultaneously on one holding, and these included all the horses that were kept. I know of a contractor keeping between fifty and sixty horses who had fourteen affected all at one time, and I have heard it stated that the disease was contagious. From the nature of the disease it is evident that this view is altogether erroneous. It is simply founded on the knowledge that a number of horses on the same farm or in the same paddock are simultaneously affected, and the fact is lost sight of that what will act as the cause in one case will likewise act in others.

Cases having their origin in the unequal pressure or pinch of a badly-fitting saddle, are by no means uncommon, but the situation of a large number of cases, especially in draught horses is slightly to the front of the withers, at the setting on of the neck to the shoulder; just at the place, in fact, against which the top of the collar is pressed when the horse throws his weight into it. If the collar is closed at the top, and especially if it is well made to fit the horse, the pressure on the withers and top of the shoulders is equally distributed, and no particular spot is bruised or pinched. The open-topped collar is however in almost universal use in Australia, and, if it does not happen to be buckled up tightly, or if the horse has improved in condition, rendering the letting out of a hole or two necessary, there is a part, directly at the top from which the mane grows, that receives no pressure at all. As the horse pulls, the two upper extremities of the padded portion of the collar on each side are of a necessity especially when the traces are attached high up on the hames, pressed backwards, downwards, and inwards, exactly at that spot *where the first sign (swelling) of fistula in this situation appears—viz.*, on each side of the backbone, just in front of the highest point of the withers. Steady pressure of this sort may only be productive of passing effect; but a jerky pressure or pinch occasioned when the road is rough, the load awkward, or weight not properly adjusted, will sooner or later result in a bruise which may be so severe as to give rise to an abscess—an abscess at this part generally resulting in fistula.

The most prolific cause however is to be found in the stumpy and stony condition of a large number of Australian paddocks, and also in the hard nature of their surfaces in the summer time. At all events, paddocked horses are very liable to fistulous withers, whether it be from rolling on stumps of trees or stones, or on the hard ground (especially in horses with high withers), or from injury to the withers by the outstanding low branches of trees when grazing in bush paddocks, or from the bite or pinch of another horse when in the act of scratching each other, or keeping off flies or other irritating insects. It is possible, too, or even probable, that Australian horses are, on account of their liability to general disease of bones, somewhat constitutionally predisposed to fistula, for the chipping off of a small fragment of one of the bony spines of the withers would excite sufficient inflammation to produce a fistula of the worst order.

TREATMENT.—When an injury is sustained to the withers, or neck, or back, be it ever so slight, means should at once be adopted to allay the swelling and inflammation. To this end of course the horse should be rested, and the saddle or collar should not be used again until the bruised part is quite hard and well. Vinegar and water, or one of the cooling lotions recommended elsewhere (see page 159) should be applied frequently. If the bruise is so severe that the formation of matter is suspected, a smart blister should be applied in order to bring it quickly to a head, and the resulting abscess should be lanced before it has pointed. If in a few days after blistering the swelling is found to contain matter it should be lanced at once. In most other cases it is advisable to allow an abscess to "point" before lancing, but in the case of a new fistula, as before pointed out, if the matter is not speedily evacuated artificially it burrows down between the muscles and sets up further inflammation. If care is taken, by making the incision sufficiently low down, that the matter has sufficient vent, that is, that it can be freely discharged without lodging anywhere, recovery will probably soon be effected, and will require no more assistance than the daily application of a dressing of antiseptic lotion or powder.

In bad cases of fistulous withers, there is no remedy but the knife, and a bold surgeon is essential to recovery. There must be no half measures. Half-measures result simply in delay and disappointment. As a general rule in old standing cases of fistula, the bolder the operation the better and quicker the recovery; of course provided always that the operator has some idea of what he is doing, and of the structures he is operating on. I have known the case of an amateur operator who, in his anxiety to deal radically with a somewhat grave case, and to produce a good impression regarding his skill on the bystanders, actually cut through the elastic cord running from the head to the withers (the *ligamentum nuchæ*, which supports the head), thereby allowing the head to drop, and rendering the animal useless for ever. However, given a case of from three to six, or even twelve months' standing, very much calloused and swollen and discharging matter from two or three openings, it is necessary to make a "bold incision" with a sharp knife down to where the matter (pus) is lodged, and to cut away all the hard, calloused flesh included in the swelling. It is necessary to thoroughly "bottom" the fistula with the knife and to get rid of all the matter, tubes and unhealthy tissues, and to create a common wound with a good opening so as to allow of the free exit of all discharges. It is simply a waste of time to put in setons or to prick the matter-containing cavities here and there, and so, for the time being, get rid of the already formed matter. The small wounds so made soon heal up, matter re-collects, and the case is as bad, or worse, than ever.

After operating in the way indicated, it is necessary to maintain the wound so created in a healthy condition until it commences to heal satisfactorily, that is, until the discharge from it gets thick and creamy, and the surface and lips present a healthy pink appearance. A solution of corrosive sublimate (one quarter ounce to a quart or two quarts of water) is one of the best dressings for this purpose. The wound should be syringed with it daily for about a week, after which some disinfectant powder, or dry-wound dressing should be used. One of the best wound powders is made by the addition of half-an-ounce of either boracic acid or iodoform to four ounces of zinc oxide or zinc carbonate (calamine). Dry lime may be dusted into the wound in the first instance if the sublimate is not procurable. Strong carbolic acid solution is also good. In a few days, or a week, say, after the first operation, it will probably be necessary

to use the knife again to trim the wound and remove any hard calloused flesh that remains, or any proud flesh that may have formed. After operation no stitches are necessary—the wound should be allowed to heal slowly from the bottom. To operate successfully it is necessary to have the horse properly secured, and, if it is not desired to throw him, a good plan is to hitch him, head and tail, to a post and rail fence—the head to one post and the tail to the next. This is one of the operations, however, in which chloroforming is of great advantage.

The use of vitrol, bluestone, or other caustics in the treatment of fistulous withers either before or after operating is to be strongly condemned. Under the circumstances of the existence of a fistula they are powerless for good and very powerful for evil, their only action being to increase the swelling and inflammation. The object of all treatment should be to get rid of the imprisoned matter and of the calloused swelling to which it has given rise, and, as pointed out above, all applications or injections or treatment of any kind will be abortive except the knife has been previously freely used.

Poll Evil.

The "poll" is the common name given to the region at the upper end of the neck on top, and immediately behind the bony ridge between the ears known as the crest of the occiput. Poll evil is the term used to describe an injury sustained in this region. It may at first be a mere bruise, but the formation of one or more abscesses quickly follows and, on their bursting, a fistula or fistulæ of a very intractable character result.

The condition is, fortunately, not a very common one in Australia, the infrequency being most likely due to the absence of the low roofs, cross-beams and doorways which are a common feature of the older English stables and which are held accountable for many cases of poll evil there.

TREATMENT is often very unsatisfactory. Free use of the knife as advised for fistula in the region of the withers is not permissible here because of the contiguity of such structures as the spinal cord and important nerve trunks and blood vessels. The abscesses should be lanced and syringed out with antiseptics, depending openings being made at the lowest part containing pus so as to allow of free discharge. Setons may be inserted to keep such openings from healing too rapidly so that discharges may not be again imprisoned.

Shoulder Tumor.

The so-called shoulder tumors which are of such common occurrence in draught horses are really not tumors, but inflammatory enlargements of slow growth. They often contain in the centre a small quantity of imprisoned pus and so partake of the nature of an abscess; but it is very rarely, and then only after a long time—two or three years—that they ever burst. They are usually situated just above the point of the shoulder and the particular tissue involved in the fibrous growth is the *levator humeri* muscle.

The almost sole cause is a collar pinch or bruise of the muscle sustained during sudden or jerky pulling when drawing heavy loads over uneven ground. Although the tenderness from such a pinch passes away quickly there remains deep-seated in the muscle a slight inflammatory swelling caused by the exudation of lymph. This exudate becomes organised (that is, transformed into living tissue by the formation of blood vessels in it) into fibrous tissue. This hard fibrous growth of tissue continues under the

influence of continued collar-pressure, until it reaches to a size which effectively interferes with proper collar-work. When hard the tumor may be the size of an emu's egg, but if softer it is generally larger. In either case the enlargement is usually circumscribed—not diffuse.

Treatment.—Blistering and setons are never of the slightest use. The only remedy is the removal of the tumor bodily with the knife. The operation is best performed with the animal in the standing posture—secured and fixed in a trevis or crush—because then the course of the carotid artery and other important structures can be best defined and accidental severance of them avoided. The primary incision should be a bold one from above downwards and extending right through the tumor to the healthy tissue beneath—splitting it into two halves as it were. Each half may then be dissected from the underlying tissues and from the skin and removed. The resulting wound or cavity will gape considerably but should not be stitched. It should be treated as a common wound with dry dressings (page 156), and occasionally syringed with a wound lotion.

Capped Elbow.

This very common and unsightly condition seldom causes lameness but it is nevertheless an unsoundness which seriously deteriorates the market value of the animal and on that account, as well as because it is a condition difficult to cure, its presence is one of rather serious importance to the owner.

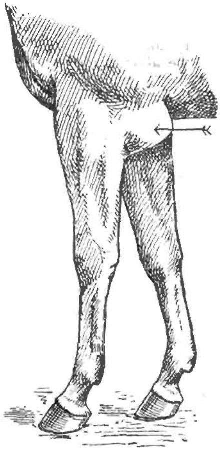


Fig. 19. Capped Elbow. (After Dollar.)

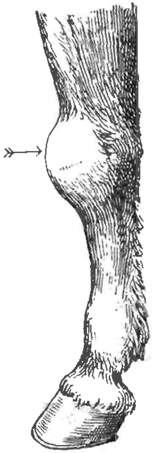


Fig. 20. Capped Knee. (After Dollar.)

Capped elbow is the result of an injury sustained to the point of the elbow (olecranon) whereby the tissues beneath the skin become inflamed and infiltrated with fluid, giving rise to a swelling which varies much in size,

but may be as big as a man's head. The injury is usually caused by the heels of the fore shoe coming in contact with the elbow when the horse is lying down. There is a bursa or synovial sheath situated between the summit of the olecranon process of the ulna bone and the tendons of insertion of the caput muscles, and it is because this bursa often becomes inflamed and distended with synovia that the condition is such a grave one.

Treatment.—When the swelling or enlargement is noticed for the first time cooling applications may be applied to reduce the inflammatory swelling, but neither these nor blisters are of much use later on. If a blister is tried the red mercury ointment is the best because of its power of promoting absorption of inflammatory exudates. If there is fluctuation of the swelling indicating the presence of fluid it should be lanced at the bottom so as to allow of free discharge. The cavity should then be injected daily with a lotion made of equal parts of tincture of iodine and glycerine; this, to stimulate adhesion of the walls of the cavity. When the enlargement is hard and fibrous the only effective remedy is removal with the knife—an operation to be performed after the manner of that recommended for the removal of shoulder tumors. After either lancing or excision the wound should be kept open until the cavity has filled up by healing from the bottom.

Capped Knee.

This condition is most often met with in hunters and steeplechasers, the injury being sustained through rapping fences when jumping. The swelling is usually situated a little above the knee and it consists of an inflammatory exudate, or, in more serious cases, of a dropsical distension of the synovial sheath through which the tendon of the *extensor metacarpi magnus* muscle passes.

Treatment.—When the injury is first sustained cooling lotions (see page 159), and cold water bandages should be applied. Later on absorption of the swelling should be stimulated by rubbing in tincture of iodine two or three times a week or applying a red mercury blister (page 75, Vol. V.) every alternate week. The removal of the swelling, however, when it has become callous is a very tedious matter and if it is of a dropsical character time may be saved by operating at once. The operation consists in lancing the distension at its lower part and evacuating the fluid which in old-standing cases may have floating or adherent masses or bands of coagulated lymph contained in it. An iodine and glycerine solution (see above) should be afterwards injected and a tight bandage applied. The injection and bandaging should be repeated daily until the walls of the cavity have united and the wound has healed. The operation must be performed under strictly a-septic conditions otherwise suppuration will ensue, and a permanent stiffening of the limb may result from the tendon becoming adherent to its sheath and consequently restricted in action.

If the swelling is not completely removed by the operation, opportunity should be taken every time the horse is given a few weeks' rest to apply a blister of red mercury ointment.

Capped Hock.

Capped hock is a condition of a similar character to capped elbow, the enlargement in this case occurring on the point of the hock and the bursa involved being that situated between the summit of the calcaneum bone (*os calcis*) and the tendon of the *gastroc-nemius* muscle just above its point of insertion.

The injury is usually sustained in kicking at some solid substance either in harness, in the paddock or in the stable. Capped hocks consequently always rouse a suspicion of vice. Some horses however have a calloused enlargement on the point of the hock produced gradually through contact with the floor when lying down.

Horses seldom go lame from capped hock; and, from the point of view of its non-interference with the usefulness of the animal it is not an unsoundness. Nevertheless it is usually regarded as such.

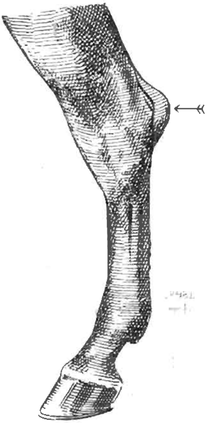


Fig. 21. Capped Hock (After Dollar)

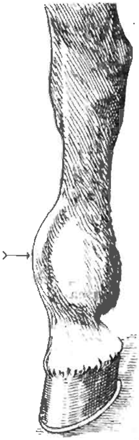


Fig. 22. Capped Shin or Fetlock. (After Dollar.)

TREATMENT.—As with other synovial distensions treatment is often unsatisfactory. In the early stages cooling applications; and later on iodine blisters, frequently repeated, are most likely to be successful.

Capped Shins.

These enlargements occur in front of the lower extremity of the cannon bone just above the fetlock, in the hind limbs usually. They are most often the result of injuries sustained through hitting fences when jumping. The condition is almost identical with capped knee and should be treated in the same manner.

BURNS AND SCALDS.

Burns and scalds may vary in severity from a slight inflammation of the skin surface to a grave condition of charring and destruction of the skin and subjacent tissues.

TREATMENT.—One of the main objects of treatment should be the protection of the injured surface from adverse external influences, such as cold, wet, dirt, and infection. For this purpose applications of oil are

admirably suited. Any of the fixed oils (castor, sweet, olive or linseed oil) will do, but carron oil, which is a mixture of one of the fixed oils with equal parts of lime water, has an additional soothing effect. When there is great pain a decoction of poppy leaves, opium or other sedative may be mixed with the carron oil. Subsequent treatment should comprise the dusting on daily of dry wound powders (page 156).

The surface blisters which form in severe burnings or scaldings should be punctured with a needle or small knife previously sterilized by heating to a red heat. If the burn or scald is on a limb the part should, after the oil treatment, be covered with a thick layer of cotton wool lightly bandaged on.

RUPTURES (HERNIÆ).

The domestic animals are not particularly liable to ruptures, but occasionally in the young of all species umbilical hernia (rupture of the navel) is met with; and in colt foals and boar piglings, scrotal or inguinal hernia (rupture into the sac of the testicles) is fairly common. It also occasionally occurs in stallions.

Navel Rupture (Umbilical Hernia).

This is a protrusion through the navel opening of some portion of the abdominal contents. It may be a loop of the bowels or it may be a portion of the caul net (omentum). The rupture is either present at birth or it may appear within two or three months after birth. It may vary in size from a hen's to an emu's egg, but whatever the size the tendency is for it to gradually get less as the animal grows older; and in most cases it finally disappears before the age of two years is reached. Sometimes the size of the rupture will vary from day to day or even from hour to hour according as the loop of bowel is full of ingesta or empty.

For differentiation of such a rupture from any other kind of swelling it will usually suffice that movement of the contained loop of bowel is felt when the enlargement is grasped by the hand; or, in case it is the omentum that is protruded, the fact that it can be pushed back into the abdominal cavity through the navel opening is sufficient evidence.

Treatment.—As stated before a cure is often effected spontaneously, but recovery may be hastened by the continuous use of a broad flat truss adjusted and kept in position by a loin strap attached to a surcingle.

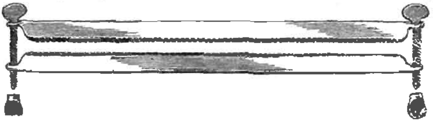


Fig. 23. Clams for Navel Rupture.

If operative interference is deemed necessary the ligature method is perhaps the most effective, as it is certainly the simplest and safest. The animal should be thrown and placed on its back in order that gravity may assist in manipulating the bowel or net through the opening into the abdomen. This done the loose skin forming the rupture sac is grasped and pulled taut, and a self-tightening ligature (clove hitch) of whip cord, cat gut or wax-end is then applied as close up to the abdominal wall as possible and drawn tight. In a few days the fold of skin external to the ligature will drop off and in the meantime sufficient inflammation has been

caused on the belly side of the ligature as to have produced occlusion of the navel opening. Another method is to use clams (see Fig. 23) instead of a ligature, but their very weight renders their use objectionable.

Scrotal or Inguinal Hernia.

This is a much graver form of rupture than the one just described. It is a condition in which the loop of the small intestine escapes through the inguinal opening (the internal and external rings) and passes down into the scrotum or testicle sac. The frequency of these ruptures in Australia may be ascribed to the relaxing effect on the tissue of the hot climate, and in this connexion it may be mentioned that in France the veterinarian Bouley has observed that inguinal hernia occurs more frequently in summer than in winter. The exact nature of this rupture will be more clearly understood by reference to the accompanying illustrations (Figs. 24, 25 and 26).

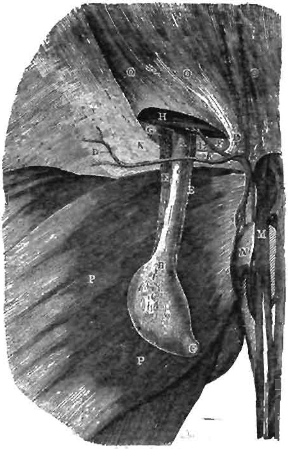


Fig. 24. Normal position of testicle and of the spermatic cord as it passes through the inguinal canal from the abdominal cavity. (After Fleming.)

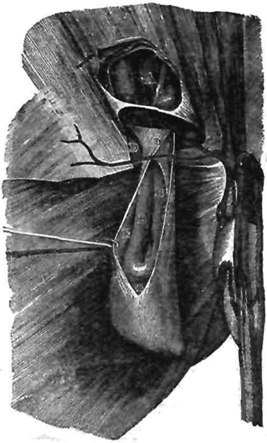


Fig. 25. Inguinal or Scrotal Hernia or Rupture. A loop of intestine is seen to have passed through the inguinal canal from the abdominal cavity along with the spermatic cord. (After Fleming.)

Inguinal hernia is often a cause of colic in entire horses, especially when the condition known as strangulated hernia exists. In this case the inguinal opening becomes constricted and compresses the part of the bowel passing through it forming a kind of neck at which "strangulation" of the protruded bowel occurs. Such cases are often fatal.

Treatment.—In all cases the animal must be thrown and placed under chloroform. Chloroforming produces relaxation of the muscles surrounding the inguinal opening and so materially assists in the replacement of the

bowel within the abdomen. This latter is a matter of some difficulty, and it is best done by turning the horse on his back, manipulating and pushing the bowel with the left hand while the right hand is introduced into the

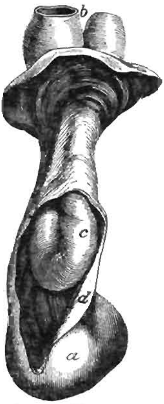


Fig. 26. Inguinal Hernia (scrotal rupture); (*a*) scrotum containing testicle; (*b*) covering of spermatic cord; (*c*) loop of bowel that has passed through inguinal canal along with spermatic cord. (After Fleming.)

rectum and used to pull the intestines downward from the inguinal opening. Sometimes it will be found impossible to effect the return of the bowel without opening the scrotum and enlarging the inguinal opening with a long probe-pointed and curved knife. After the bowel has been returned a pair of wooden clams should be put on above the testicles and as near the abdominal wall as possible so that the re-entry of the bowel into the inguinal canal may be made difficult. The clams may be removed in twenty-four hours.

In the castration of colts and young pigs affected with this kind of rupture a special operation known as the "covered operation" is necessary but this can only be done without danger by a skilled surgeon and anatomist.

LAMB-MARKING.

H. W. Ham, Sheep Expert.

Ear-marking, castrating, and tailing of lambs are known to sheep men under the term of lamb-marking. This term, is given because ear-marking, being the guide to ownership, is the most important of the three practices.

Ear-marking.—There are several systems of ear-marking, and each is more or less correct. Some are cumbersome, and only suited to stud flocks. The worst evil is too large an ear-mark, a small neat one being sufficient. When a large ear-mark is put on a young lamb it grows as the lamb grows, and, in after years, looks bad for no real benefit. Some ear-marks, made with the knife, are clumsy, and very unsightly.

With stud masters the old style ear-label is still in most favour, and aluminium metal is preferable to galvanized. A good method of putting these in the ears is to make two punch holes, as far apart as the length of the label, and clasp the label on the ear lengthwise, not too tightly, keeping the number uppermost. There is less likelihood of it being torn out through getting caught in netting, or in troughs, when it is necessary to feed the sheep; it also looks very neat. With a little observation and practice the vein in the ear can be avoided, and no bleeding caused.

Castration.—Castration of lambs has of late years undergone some changes in the right direction. Our wool-growers' style of slashing off sometimes half the purse, or slitting it half-way down, in order to get at the testicles more quickly, is dying out. Lambs are often slit to the full depth of the purse, and the flesh laid bare, owing to the operator being forced to get through from three to four thousand lambs in a day. These methods of slitting or cutting off, when carried out carefully, are satisfactory enough to the wool-grower, but, with lambs intended for export at an early age, as in the case of small farmers, the slower method of making a small incision in each section of the purse is preferable. Some argue that the cutting off or slitting allows the blood to drain away. The side-cut does not admit of this, but it will be found that more trouble arises from the use of a dirty knife, or from bleak, windy weather, or frost. With the deep slit, or the purse cut off, lambs are liable, when lying down, to pick up dirt, etc., and cold winds are more to be feared than when the small opening method is adopted.

When speed is necessary for larger numbers yarded, splitting, when done shallow, is the best method. Proud cutting of lambs will be found an advantage to lamb-raisers. The wool-growing style is to draw with the teeth, and, in doing this, the cords are dragged out also. If the lamb be proud cut carefully, he will fatten equally with the ewe lambs. Most lamb-raisers find a greater proportion of the ewe lambs ready before the wether lambs. With wool-growers' flocks there are usually too many lambs yarded to practise any other than quick methods. Ewes and lambs on large properties cannot be starved in the yards too long, but with smaller holders there is no need for such hurry. Small farmers copy the large land-holder in too many things, especially in lamb-marking and time of lambing, and also in many shearing and wool preparation matters.

Proud cut wether lambs, at four mouths old, have heavier fore-quarters, and have not had such as severe a check as teeth-drawn ones. The purse is taken hold of, with the thumb and forefinger, thumb uppermost, and drawn fairly tight. The incision is made on the side, low down, near the body; this is the secret of being able to hold the stone easily with the

fingers. If the cut is high up it is much harder to get it. The incision must not be too large; where the cut is made will be through double skin, and half-an-inch through this double skin will mean an inch opening, which is often too large. Cut both openings right away—no need to change bands—the stone will be found close to the opening, and will come out easily, and need no straining. Hold it with the thumb and fore-finger, and, if it is an old lamb, take the stone out of the casing, and leave this part in also. If young, say, under six weeks, take the testicle off with a half-rubbing, half-cutting action, and leave in all the cord possible. Use a clean knife; a little Lysol is always handy for many things in sheep work.

Tailing.—Searing the tails has come into favour greatly, and rightly so. The bulk of our lamb-marking is done in the cold months, and searing has been proved beyond doubt to be better than the old style. It should not be practised in warm weather, as flies are attracted thereby. The maggots get in under the scab and cause a lot of trouble and subsequent watching to get rid of them. In the case of sheep, with long tails, left over a year, searing the veins, after taking the tail off, is a very old custom. From this custom the idea came to careful stud sheep men to have, at lamb-marking time, in a fire close by, some pieces of thick fencing wire about sixteen inches long (the old No. 6 wire that came into the country in early days). With these they would touch the veins after the tail was taken off, the object being to save loss of blood. Very often these breeders were exhibitors of sheep, and had been feeding their ewes and lambs liberally on fodder crops, as many of our lamb-raisers do now. They found that their lambs, especially on a fairly warm day, bled freely, and often showed the effects of it for a fortnight or three weeks afterwards. A keen exhibitor regrets this loss of time, as it means loss of growth and early development.

From the practice mentioned the searing iron was evolved. The idea was to do the operation with one instrument, and for the purpose, a searing iron, used in the old style of colt castration, was used. It stopped the blood, but unless a joint was struck it was hard to get through. A few lambs were treated by this method, and then a number one horse-brand was thought of. This was used and worked well; the handle being upright, more weight could be brought on the tail. It was found that, although a man could always strike the joint with the knife, he needed to re-learn his work to get the joint with the iron; but no ill after-effects were noticed where the joint was not struck. With stud sheep it is the custom, in order to leave a private mark, to draw the knife across the tail, near the body, before taking it off. Under the new style of tailing, this advantage was thought to be lost, but the iron was found to do as well by touching the skin before taking the tail off. In Longwools a variety of marks can be made, on the inside of the thigh, and in a very little time.

The branding iron was just about the bluntness of the back of an ordinary knife. It was thought that it should be sharper, but it was found, that if it were put through with a jerk, as is done with the knife, that it cut through too quickly, and did not sear the veins, which are met with just after going through the skin. A rather blunt one was then adopted, as it allowed an instant or two to sear. After a while it was found that the action of the fire kept the iron at just about the right degree of bluntness. This class of iron was in use a year or two, and worked well enough, but it was recognised that heavier irons would hold the heat

longer, for, apart from the cooling action of a windy day on them, the ewe lambs would at times urinate as soon as the iron was placed on the tail, and so cool it. A much heavier iron was made; at first a wooden handle was attached, but, as this gradually got burnt, an iron handle was turned on it. It did not matter whether an open fire or an oil drum was used; a bucket of water was kept near, in which the handle could be cooled.

The heavy iron was too thick, and held too much heat. It burnt the anus of the wether lambs, and the entrance to the genital organs of the ewe lambs, which, in the latter case, could be noticed in after years, and was thought to make more difficult the service of the ram. For general purposes, an iron, three-quarters of an inch in thickness, is therefore better. A handy size is two and a-half inches wide, and two inches deep, with the cutting-edge sloped V-shaped, equally on both sides, from a blunt edge to an inch up; the handle should be sixteen inches over all.

The man holding the lamb can do a lot towards preventing the burning. When a man has been used to holding for the knife he will lean the lamb forward, for, as soon as the tail is off, he merely lets go, and the lamb drops over the fence, but with the iron in use the lamb should be held leaning backwards. There is more in holding lambs for the iron than for the knife. The iron can be leaned slightly away from the lamb as well—there is no excuse for burning them. There are several handy ways of using three-quarter-inch boards to go between the iron and the lamb. There are careful and very neat ways of doing the work, and they are in use mostly with owners not bound to time in getting flocks out of the yards. Some owners have one side of the iron made with a bulged surface, so that in going through it presses more against the veins. This iron needs careful handling; as each tail is treated the operator must see that the right side is to the lamb, and that the latter is not burnt.

Some owners are doing good work with an instrument made like a very large pair of scissors. The patented machines also do good work, but with the farmer the plain iron is mostly used. It is either home-made or made by the local blacksmith, and when an iron handle is turned on it, will last a lifetime.

In late spring and early summer, and in autumn, flies are troublesome, and the knife is then the best, but, as a rule, there are not many lambs at those times to tail. When tailing with the knife, it comes natural to pull on the tail, but if a little time is taken, the habit can be acquired of holding the tail loosely. After the customary glance at the lamb to form an idea of age, and consequently the likely distance of the joints apart, the thumb is run over to find the joint. Then, instead of pulling the loose skin towards the operator, push it towards the lamb, and when placing the knife on, keep it just a little to the operator's side of the joint, and also press slightly towards the lamb. By so doing it will be found that when the tail is off, the loose skin, that has been pushed towards the lamb, will come back over the end of the tail where severed, cover the two veins, and check the flow of blood.

THE PROCLAIMED PLANTS OF VICTORIA.

(*Continued from page 170.*)

Alfred J. Ewart, D.Sc., Ph.D., F.L.S., Government Botanist; and J. R. Tovey, Herbarium Assistant.

The Onion Weed.

Asphodelus fistulosus, Linn. *Liliaceæ*.

Root fibrous; leaves many in a dense basal rosette, awl shaped, grooved, hollow, about a foot long tapering to the apex. Flowering stem, hollow, branching, 1 to 2 feet long. Flowers small, white, or pale pink in loose clusters.

An introduction from Southern Europe. This onion-like plant is a very injurious weed. It has made its appearance in several places, suppressing almost all other vegetation. It should be dug up before flowering, and burned with the aid of brushwood, or mixed with quicklime. Ploughing, root-crops, and summer fallowing keep it under.

Proclaimed for the Shires of Bellarine, South Barwon, Port Fairy, and Queenscliff.

CHEESE EXHIBITS AT THE A.N.A. EXHIBITION, 1908.

Judges.—J. G. McMillan, N.D.D. (Cheese Expert, Department of Agriculture) and A. W. Woodard (J. and J. Lonsdale and Co., Limited), late Cheese Expert, Canadian Department of Agriculture.

The second display of cheese in connexion with the above exhibition took place in January and February. The total entries were 150, as compared with 90 last year. This year there were three extra classes, and the manner in which cheesemakers responded was gratifying. The greatest falling off was in the export class, there only being 16 entries as compared with 25 in 1907. The decrease of entries in this class is to be deplored. Good prizes were given, but even that seems to be insufficient to get dairymen to display an enthusiasm in the development of an export trade; the most pessimistic will admit that such development is essential, but they are not unselfish enough to exploit the market themselves. The pioneering is left to a few who by their energy and pluck relieve the market on this side, resulting in a rise of prices to those who retain all their products on the local market. To again enumerate the advantages of export is superfluous, as the benefits to be derived have been quoted frequently in the *Journal* and other publications.

The specifications for the various classes were as follow:—

Class G.—1 ton export cheese, not more than 3 months old.

Class H.—300 lbs. cheese, not less than 6 weeks old, nor under 40 lbs. weight.

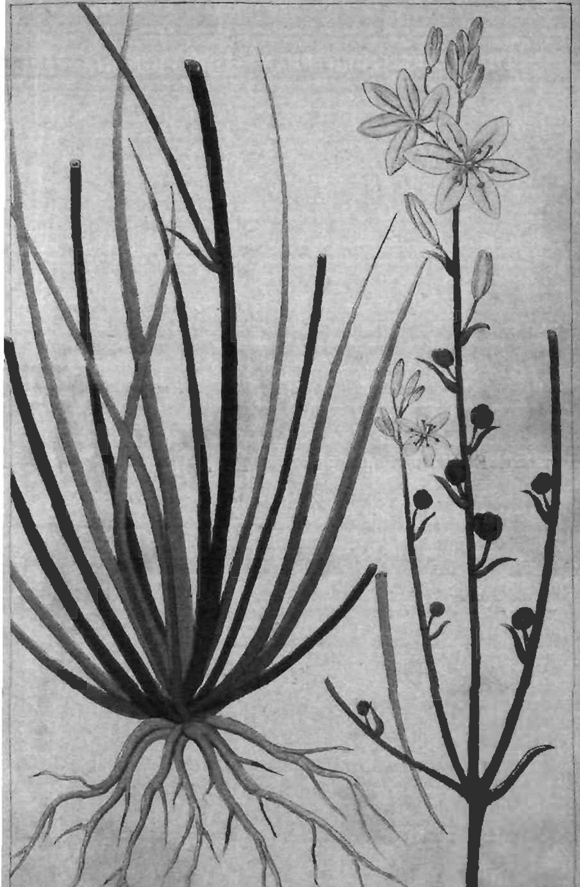
Class J.—112 lbs. loaf cheese, any age, not over 12 lbs. each.

Class K.—4 loaf-size cheeses, not under 6 weeks old, nor more than 12 lbs. each.

Class L (Surprise Class).—4 40-lb. cheeses, to be taken at random.

Class M (Surprise Class).—4 loaf cheeses, not more than 12 lbs. each, to be taken at random.

PLATE 23.



ONION WEED.

(*Asphodelus fistulosus*, Linne)

PRIZES AND AWARDS.

CLASS G.—*Prizes*:—1, Government Gold Medal, A.N.A. Exhibition Certificate, and £13; 2, £8; 3, 4, and 5, Certificates.*

Awards.—1. Cobrico Cheddar Coy., Boorcan (94.75 points); 2. Clachan Cheese Dairy, Cororooke (93.75); 3. D. and J. McRae, Larpent (92.5); 4. Tandarook Cheese Factory (91.5); 5. J. McGuire, Garvoc (90.75).

The range of quality in the export section was from first to second class. The first three lots were of very good quality.

CLASS H.—*Prizes*:—1, Silver Medal, A.N.A. Exhibition Certificate, and £5: 2, £3; 4, 5, and 6, Certificates.

Awards.—1. Cobrico Cheddar Coy. (94.25 points); 2. Alex. McRae, Larpent (92.75); 3. Noel Bros., Kolora (92.25): 4. Noel Bros. (91.75); 5. Grasmere Butter and Cheese Factory (91.5).

This class was well represented, the entries being well over those of last year. The quality was of wide variation ranging from first to third grade. Many lots had suffered considerably through the heat.

CLASS J.—*Prizes*:—1, Silver Medal, A.N.A. Exhibition Certificate, and £4; 2nd, £3; 3, 4, and 5, Certificates.

Awards.—1. Clachan Cheese Dairy (92.75 points); 2. Cobrico Cheddar Coy. (92.5); 3. Yabba Cheese Factory, Tallangatta (92); 4 D. and J. McRae (90.25); 5. Flowerdale Cheese Factory, Yea (90).

There were some very fine cheese in this class, and some were very middling.

CLASS K.—*Prizes*:—1, Silver Medal, A.N.A. Exhibition Certificate, and £3; 2, £2; 3, 4, and 5, Certificates.

Awards.—1. Clachan Cheese Dairy (92.5); 2. Cobrico Cheddar Coy., (92); 3. Yabba Cheese Factory (91.5); Grasmere Butter and Cheese Factory (91); 5. James Reid, Tambo Upper (90.5).

The quality ranged from first to third grade.

CLASS L.—*Prizes*:—1, Silver Medal, A.N.A. Exhibition Certificate, and £2; 2, £1; 3, 4, and 5, Certificates.

Awards.—1. Cobrico Cheddar Coy. (93.5); 2. G. F. Bartlett, Morwell (91.75); 3. Noel Bros. (91); 4. Flowerdale Cheese Factory (90.5); 5. Tandarook Cheese Factory (89.5).

As a "surprise" this class was satisfactory.

CLASS M.—*Prizes*:—Silver Medal, A.N.A. Exhibition Certificate, and £2; 2, £1; 3, 4, and 5, Certificates.

Awards.—1. Clachan Cheese Dairy (93); 2. James Reid (91); 3. C. W. Meredith, Ondit (90.5); 4. Wangerrip Cheese Factory, Beech Forest (89.5); 5. Alexr. McRae (89).

CLASS N.—Grand Championship of Australia.—*Prize*:—Government Silver Cup, A.N.A. Exhibition Certificate, and £5.

Award.—Cobrico Cheddar Coy.

The basis of judging was as follows:—Flavor 50, texture 30, color 15, finish 5; total 100. The remarks on each exhibit are for instructional purposes, and do not necessarily mean disparagement. "Unclean" does not mean dirt, but unclean flavor. "Overheated" signifies overheated after manufacture.

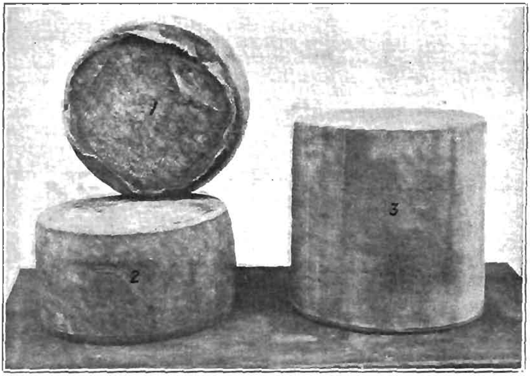
*Certificates:—3, Very highly commended; 4, highly commended; 5, commended.

Packing.

In the export class some crates were of bad shape, and too much space was allowed for each cheese. The sizes were fairly suitable this year, but it would be better if the 80 lb. sizes were adopted. Crates should be bound with wire.

General Remarks.

The secret of successful cheese-making is based upon three conditions, viz., proper care of the milk by the supplier, proper handling of the milk by the maker, and proper curing of the cheese. In judging the cheese at the Exhibition, we found evidence of neglect in the conditions mentioned much more pronounced in the former and latter than in the second.



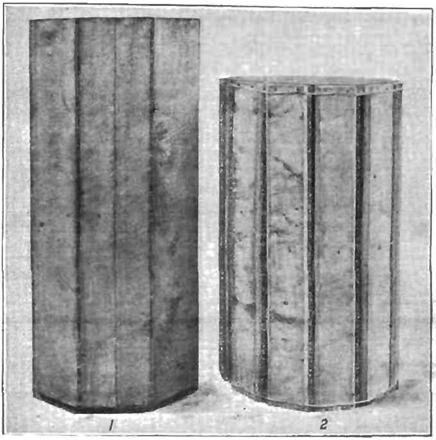
CHEESE FOR EXPORT.

1. Badly finished cloths—too long and rough; 2. Good finish; 3. Suitable for export and showing good finish.

Care of the Milk.—There was strong evidence of the supplier not taking proper care of the milk—delivering it to the maker in an over-ripe condition. This was characterised by the fact that many cheese were sour, "acidy," and crumbly. On the whole the cheese were fairly well made, showing that the makers had done their part as well as could be expected under the circumstances.

Defects in the Manufacture.—The principal defect due to the making was that where the cheese was open and loose in texture. This is generally caused by not giving the curd sufficient time after removing the whey before salting. On the whole the cheese were well finished, but we consider that the finish could be improved by getting larger and proper hoops for pressing.

High Temperature and Curing.—The greatest and most serious defect in the cheese exhibited was in the curing. Every cheese showed signs of being overheated either while being cured or during transportation, and many of them were spoilt. A cheese is only half made when it leaves the press, and it can be spoilt or improved during the process of curing. No matter how well the supplier may care for the milk, no matter how much care and pains the maker may take in the manufacturing process, if the cheese is not subject to a proper condition for curing, the flavor and texture are greatly injured thereby. It has been found through various experiments that a temperature between 55 degrees and 60 degrees is best suited for the proper curing of cheese. A temperature even as high as 65 de-



CHEESE CRATES.

1. Shape unsuitable and boards too close together; 2. Suitable shape, showing wire binding, and laths placed at proper distance apart.

grees may be allowed without any great injury being done to the cheese, but this we consider is the safety point; beyond this there is some risk, especially if the cheese is made from poor milk. If Australia is ever going to take a position in the exporting of cheese to the Home market, the first things to be considered are proper care of the milk and proper curing. If it is possible to keep the milk at a temperature below 65 degrees at the farm and to deliver it to the cheese-maker clean, and in that condition cure the cheese at a temperature of 60 degrees, there is no reason why Australia should not compete in the Home market with any country in the world.

Class G.—1 ton Export Cheese, not more than 3 months old.

Catalogue No.	Competitor.	Points Awarded. Flavor, 50.	Texture, 30.	Color, 15.	Finish, 5.	Total, 100.	Judges' Comments.
87	*Clachan Cheese Dairy*	47.75	27.5	14.5	4	93.75	F. Fairly clean. T. Rather weak. C. Good. F. Rind's cracked, crates bad *shape, and too much* space between cheese and ends; affected by heat
86	Cobrico Cheddar Co.	47.25	28.5	14.5	4.5	94.75	F. Fairly clean. T. A little open, but silky. C. *Good.* F. Good
91	Grasmere Factory	45	25.5	13.5	4	88	F. Hardly clean. T. Weak, pasty. C. Irregular. F. Crates too large and badly bound
91A	Grasmere Factory	46	25	14	4	89	F. Not clean. T. Curd insufficiently cured before salting; too short. C. Good. F. Crates too large and badly bound
92	D. and J. McRae, Larpent	47	27.5	13.5	4.25	92.25	F. Not clean. T. *Irregular, some* "acidy"; F. Fair; overheated
93	McConachy Bros., Cororooke	45.5	26	14	4	89.5	F. Not clean. T. Dry, crumbly; and insufficiently mellowed *before salting.* C. Motley. F. Crates too long for cheese, bad cases; badly overheated
94	James McGuire, Garvoc	46	26.75	14	4	90.75	F. Not clean. T. Weak body. C. Fair. F. Rind's cracked; *overheated*
95	Tandarook *Cheese Factory*	46	27	14	4.5	91.5	F. Unclean. T. Soft, weak. C. Good. F. Nice shape, good size, and well finished; *partitions in crates too thin,* and should have been nailed; badly spoilt by heat
97	*Hugh Hennessy, Bena*	45	25	13	4	87	F. Heated. T. "Acidy," mealy. C. Bleached. F. Shape good, but rinds cracked; *overheated*
98	Upper Maffra Factory, Newry	45	24	12	4	85	F. Sour. T. Short, corky, "acidy." C. Bleached white. F. Crates too long, otherwise good
100	Ludlow's Sutton Grange Factory	46	25	12	4	87	F. *Irregular.* T. "Acidy," mealy, short. C. Bad, motley, irregular. F. Crates bad shape, too much space for cheeses, partition not nailed

Class H.—300 lbs. Cheese, not less than Six Weeks old nor under 40 lbs. Weight.

101	Clachan Cheese Dairy ..	46	26	13.5	4.5	90	F. Some good, some "off." F. Mushy, weak body, pasty. C. Bleached. F. Good; badly overheated
102	Cobrico Cheddar Co. ..	47	28	14.5	4.75	94.25	F. Slightly irregular. T. Rather open and green. C. Good, slightly irregular. F. Good; slightly overheated
103	B. Conlon, Terang ..	41	25	13	4	83	F. Rank and "off." T. "Acidy," mealy, and open. C. Irregular and bleached. F. Cloths too long; overheated
104	Grasmere Factory ..	46.5	28	13.5	3.5	91.5	F. Weedy. T. Mealy, sweet, curd not sufficiently matured before salting. C. Irregular. F. Bad shape and rinds cracked; bad appearance
106	R. Hammond, Larpent	40	25	13	4	82	F. Rank. T. Open, "acidy," mealy. C. Bleached. F. Cloths too long; heated
110	D. and J. McRae, Larpent	47	25.5	12.5	4.5	89.5	F. Not clean. T. Mealy, "acidy," crumbly. C. Bleached. F. Good, but mouldy; badly overheated
110A	D. and J. McRae, Larpent	47	25	12.5	4.25	88.75	F. Not clean. T. Corky, mealy, "acidy," crumbly. C. Bleached. F. Good; overheated
111	Alex. McRae, Larpent	47	27.5	13.5	4.75	92.75	F. Not clean. T. Too open and mealy. C. Slightly bleached. F. Very good; heated
112	McConachy Bros., Cororooke	46	26	13	4.75	89.75	F. Not clean. T. Mealy, "acidy," dry, corky. C. Bleached. F. Good; badly heated
113	James McGuire, Garvoc	47	25	12.5	3.75	88.25	F. Rather insipid. T. Body weak and open, lacking acid. C. Irregular, some showing mould inside F. Poor
114	Noel Bros., Kolora ..	47.5	27	13.5	4.25	92.25	F. Irregular; some good, some "off." T. Weak and sweet; affected by heat. C. Too deep. F. Good, except for cracks on rinds
114A	Noel Bros., Kolora ..	47.5	26.5	13.5	4.25	91.75	F. Some good, some "off." T. Open and sweet. C. Too deep. F. Good, but cracked on rinds; badly heated
115	Tandarook Cheese Factory	45	25	12	4	86	F. Sour and irregular, some weak. T. Mealy, crumbly, "acidy." C. Bleached. F. Fair, but cloths too long; spoilt by heat
115A	Flowerdale Factory ..	45	25	13	3.75	86.75	F. Not clean, one rank. T. Mealy, "acidy," and irregular. C. Bleached and irregular. F. Fair; ragged cloths
115B	Molesworth Factory ..	40	24	12.5	3.75	80.25	F. Rank. T. Soft, mushy, open; too much whey. C. Bleached. F. Cloths too long; cheese puffy
116	Boisdale Cheese Factory	40	26.5	12.5	4	83	F. Rank. T. Fairly close, mealy, "acidy." C. Bleached. F. Cheese a good shape, but cloths too long and rough
116A	Boisdale Cheese Factory	40	26.5	12.5	4	83	F. Rank. T. "Acidy," mealy, sour. C. Bleached. F. Cloths too long, but cheese a good shape; overheated

CLASS H.—300 LBS. CHEESE, NOT LESS THAN SIX WEEKS OLD NOR UNDER 40 LBS. WEIGHT—*continued.*

Catalogue No.	Competitor.	Points Awarded. Flavor, 50.	Texture, 30.	Color, 15.	Finish, 5.	Total, 100.	Judges' Comments
117	Cowwarr Butter and Cheese Factory	42	26.5	12.5	4	85	F. Over ripe and rank. T. Mealy, "acidy." C. Bleached. F. Fair; overheated
119	Hugh Hennessy, Bena ..	46	26.5	13	3.75	89.25	F. Not clean; some sweet, some "acidy." T. Corky, dry, irregular, and insufficiently matured before salting. C. Some bleached. F. Bad, cloths rough and too long; overheated
120	Peter Irvine, Orbost	46	26	12	3	87	F. Irregular. T. Irregular; *some too sour, mealy.* C. Bleached and irregular. F. Bad; dirty appearance; badly affected by *heat*
121	Jas. Reid, Tambo Upper ..	44	24	13	4	85	F. "Off." T. Soft, mushy; insufficient acid. C. Too deep. F. Fair, but too bulgy on sides
122	Upper Maffra Cheese Factory ..	40	26.5	13.5	4	84	F. Rank, rancid. T. Soft, weak. C. Slightly bleached. F. Cloths too long, fair; overheated
123	W. H. Uren, Loch	47	27	13	3.75	90.75	F. Not clean. T. Mealy, "acidy." C. Irregular. F. *Cloths* too rough; overheated
124	Ludlow's Sutton Grange Factory	43	24	12	4.25	83.25	F. Not clean; "*off,*" *rank.* T. Crumbly, "acidy," sour. C. Bleached. F. Fairly good; overheated
124A	Ludlow's Sutton Grange Factory	40	24	13	4	81	F. "Off," rank. T. Sour, "acidy," mealy. C. Bleached. F. Fairly good; overheated
125	J. F. Manus, Kyabram ..	44	24	12.5	3.75	84.25	F. Sour smell; bad milk. T. Dry, sour, mealy, crumbly. C. Bleached. F. Dirty, cloths rough; overheated
126	Circular Head Factory, Tasmania	42	24	13	3.75	82.75	F. Rank and irregular. T. Mealy, "acidy," open. C. Bleached. F. Cloths too long; overheated
127	Pardoe Cheese Factory, Tasmania	43	24	12	4	83	F. "Off," rank. T. Mealy, "acidy." C. Bleached. F. Un-*shapely; bad color*
128	Tasmanian Produce and Cool Storage Ltd.	46	27	14	4	91	F. Not clean. T. Rather soft. C. Good. F. Cloths too long

130	Manus Cheddar Co., N.S.W. ..	43	23	12	3.5	81.5	F. Rank; over ripe. T. Mushy, open; some devoid of texture entirely. C. Bleached. F. Cloths too long and dirty; destroyed by heat
131	Wolseley Park Cheese Factory, N.S.W.	43	24	12	3	82	F. "Off," rank. T. Dry, crumbly, sour, "acidy." C. Bleached. F. Bad; destroyed by heat, and evidently knocked about in transit

CLASS J.—112 LBS. LOAF CHEESE, ANY AGE, NOT OVER 12 LBS. EACH.

132	Clachan Cheese Dairy	48	27	13.5	4.25	92.75	F. Very regular and clean. T. Body heated; loose, open, mealy. C. Bleached. F. Good; evidently a well made cheese, but spoilt by heat
133	Cobrico Cheddar Co.	46	28.5	13.5	4.5	92.5	F. Irregular. T. Fairly good, but open. C. Motley. F. Good; overheated
137	R. Hammond, Larpent ..	40	26	13.5	4	83.5	F. Rank. T. Open, mealy, "acidy." C. Bleached. F. Cloths too long; overheated
138	D. and J. McRae, Larpent ..	47	26	13	4.25	90.25	F. Not clean. T. Mealy, corky, and dry. C. Bleached. F. Nice and square on edges, but too much cloth; an evidently well made cheese destroyed by heat
139	McConachy Bros., Cororooke ..	46	25	13	4.75	88.75	F. Fair. T. Corky and dry, crumbly, mealy; too highly cooked. C. Irregular. F. Very good; badly affected by heat
140	Tandarook Cheese Factory ..	46	25	13	4	88	F. Not clean. T. Mealy, "acidy." C. Irregular. F. Cloths not neat; badly overheated
141	C. W. Meredith, Ondit	44.5	27.5	13.5	4.25	89.75	F. Not clean. T. Sweet, open; lacking fattiness. C. Too deep. F. Good; overheated
142	Boisdale Cheese Factory ..	40	26	13	4	83	F. Rank. T. Sandy and mealy. C. Bleached. F. Good, but cloths too long; overheated
143	Cowwarr Cheese Factory ..	44	23	11	3.5	81.5	F. Not clean. T. Sour, open, mealy body; not sufficiently cooked. C. Bleached. F. Bad shape; cloths too long; overheated
146	James Reid, Bruthen	45	26	13.5	4.25	88.75	F. Not clean. T. Weak, mushy, open; too soft, too much whey. C. Irregular. F. Fair, but for cracks on rinds; overheated
149	P. A. Olsen, Poowong ..	45	26	13	4	88	F. Not clean. T. "Acidy," mealy, fairly close. C. Irregular, bleached. F. Cloths rough; overheated
150	Yabba Cheese Factory, Tallangatta	46	28	14	4	92	F. Not clean. T. Open; curd insufficiently matured before salting. C. Good. F. Good shape, but discolored rinds
150A	Flowerdale Factory	45	27	13.5	4	90	F. Irregular; some of outstanding quality. T. "Acidy," sour. C. Irregular. F. Fair; cloths rough

Catalogue No.	Competitor.	Points Awarded. Flavor, 50.	Texture, 30.	Color, 15.	Finish, 5.	Total, 100.	Judges' Comments.
	CLASS J.—112 LBS. LOAF CHEESE, ANY AGE, NOT OVER 12 LBS. EACH—*continued*.						
150B	Molesworth Factory	40	25	13	4	82	F. Rank. T. Mealy, "acidy," open, weak. C. Bleached. F. Fair, cloths too long
151	Ludlow's Sutton Grange Factory	45	27	13	4.25	89.25	F. Not clean. T. "Acidy," mealy. C. Bleached. F. Good; overheated; a good cheese spoilt
151A	Ludlow's Sutton Grange Factory	43	26	13	4.75	86.75	F. Not clean. T. Irregular. C. Irregular. F. Good; overheated
151B	Emu Flat Factory	41	24	12	4	81	F. "Off." T. Mealy, "acidy," sour. C. Bleached; poor. F. Fair; overheated
154	Wolseley Park Factory, N.S.W.	..	..	..	..	..	This cheese was too damaged in transit to enable it to be judged, but from all appearances it was a good lot at one time
155	Circular Head Factory, Tasmania	41	27	13.5	3.75	85.25	F. Rank, "off," irregular. T. Irregular. C. Some good, some bleached. F. Cloths too long; bad shape
	CLASS K.—FOUR LOAF-SIZE CHEESES, NOT UNDER SIX WEEKS OLD NOR UNDER 12 LBS. EACH.						
156	Clachan Cheese Dairy	48	27.5	13	4	92.5	F. Good. T. Mealy. C. Bleached. F. Fair; badly overheated
157	Cobrico Cheddar Co.	46	28.5	13	4.5	92	F. Not clean. T. Rather open. C. Motley. F. Good
159	Grasmere Factory	45	28.5	14	3.5	91	F. Not clean. T. Rather open. C. Good. F. Bad, rinds cracked
162	D. and J. McRae, Larpent ..	45	24	13.5	4.5	87	F. Not clean, overheated. T. Mealy. C. Bleached. F. Good; overheated
163	Alex. McRae, Larpent ..	47	26	13	4	90	F. Fairly clean. T. Body open; sweet. C. Irregular and deep. F. Fair; overheated
165	McConachy Bros.	46	25	13	4.5	88.5	F. Not clean. T. Body open; mealy. C. Irregular. F. Good; overheated
166A	C. W. Meredith	43	26	12	4	85	F. "Off." T. Too weak; open. C. Too high and dull. F. Fair; overheated

167	Boisdale Cheese Factory ..	41	24	12	4.5	81.5	F. Badly "off." T. Mealy, soft, "acidy." C. Bleached white. F. Cloths too long; overheated
168	Cowwarr Factory	43	27	13	4	87	F. Not clean: "off." T. Mealy and "acidy." C. Bleached. T. Fair; overheated
170	Charles Hammond, Poowong ..	45	24	13	4	86	F. Not clean. T. Soft, mushy, pasty, weak. C. Bleached. F. Fair; overheated
166	Wangerrip Cheese Factory .	45	25	13	4	87	F. Not clean. T. Weak, soft, open. C. Bleached; irregular. F. Fair
175	James Reid, Tambo Upper ..	46	26.5	13.5	4.5	90.5	F. Not clean. T. Body weak and open. C. Fair. F. Good; overheated
177	W. H. Uren, Loch	46	25	12	4	87	F. Not clean and irregular. T. Dry and open. C. Very irregular. F. Fair; overheated
178	Upper Maffra Factory ..	45.5	26	14	3.5	89	F. Not clean. T. Body sweet, weak, and open. C. Irregular but fairly even; not clear. F. Bad shape
178B	Flowerdale Factory	40	27	12	4	83	F. "Off"; irregular. T. Very irregular. C. Irregular. F. Fair; spoiled by heat
178C	Molesworth Factory	42	24	13	4	83	F. Not clean. T. Body weak, mushy, open, pasty. C. Bleached. F. Fair; overheated
178D	Yabba Cheese Factory. ..	46	28	13.5	4	91.5	F. Sweet, not clean. T. Open. C. Irregular; rather bleached. F. Ends discolored
179	Emu Flat Factory	40	24	11.5	4	79.5	F. Very rank. T. Sour, mealy, crumbly. C. Bleached white. F. Open; overheated
181	Circular Head Factory, Tasmania	40	26	12	4	82	F. Rank. T. Irregular; some cheese open, some sour. C. Irregular in different cheeses. F. Fair; badly affected by heat
182	Manns Cheddar Co., N.S.W. ..	45	24	12	3.5	84.5	F. Not clean. T. Short and sour. C. Bleached. F. Cloths too long

CLASS I.—(SURPRISE CLASS.)—FOUR 40-LB. CHEESES, TO BE TAKEN AT RANDOM.

184	Cobrico Cheddar Co.	46.5	29	14	4	93.5	F. Two cheeses very good and clean, two rather strong flavor. T. Good. C. Good. F. Fair
185	Grasmere Factory	43	26	13	3.5	85.5	F. Two very rank (40 points), two, 46 points. T. Corky and open. C. Too deep; irregular. F. Cloths too long
186	P. Kenna, Framlingham ..	42	25	12.5	3.25	82.75	F. "Off," strong. T. Mealy and "acidy." C. Bleached. F. Fair, but dirty; overheated
187	K. McDonald, Terang	44	25	12.5	4	85.5	F. Over ripe. Weak, pasty, open. C. Bleached. F. Fairly good; overheated
188	D. and J. McRae, Larpent ..	44	25	12	4	85	F. Strong. T. Mealy, sour, "acidy." C. Bleached. F. Fair; overheated

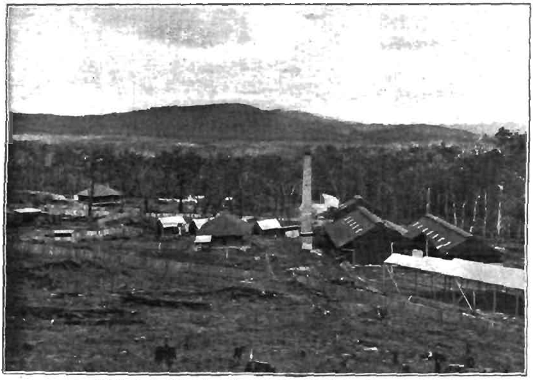
Catalogue No.	Competitor.	Points Awarded. Flavor, 50.	Texture, 30.	Color, 15.	Finish, 5.	Total, 100.	Judges' Comments.
	Class E.—Surprise Class.—Four 40-lb. Cheeses, to be taken at random—*continued*.						
189	Noel Bros., Kolora	46	27.5	13.5	4	91	F. Some good, some fair. T. Good silky body, but too open. C. Irregular. F. Fair.
190	Tandarook Factory	43.5	27	13.5	3.5	89.5	F. Not clean. T. Rather *mealy*. C. Fair. F. Bandage too long
191	Wangerrip Cheese Factory ..	42	26	13	3.75	84.75	F. Whey smell; "off." T. Weak, open. C. Irregular. F. Rough; curd insufficiently cooked and too little acid
191A	McConachy Bros., Cororooke ..	44	26	13	4	87	F. Not clean. T. Mealy, "acidy." C. Bleached. F. Fair
192	G. F. Bartlett, Morwell ..	45	28	14.5	4.25	91.75	F. Sweet, whey smell. T. Rather *open*. C. Good. F. Good, but cheeses bulged
193	Boisdale Cheese Factory ..	40	27	13	4	84	F. Rank; "off." T. Mealy and "acidy." C. Bleached. F. Fair, but cloths too long; overheated
194	Cowwarr Cheese Factory ..	41	27	12	4	84	F. Rank; "off." T. Mealy, "acidy." C. Bleached. F. Fair, but cloths too long; overheated
194A	Hugh Hennessy, Bena ..	44	27	13.5	4	88.5	F. Not clean. T. Mealy, corky, dry. C. Irregular. F. Fair; overheated
194B	Flowerdale Factory	46	27	13.5	4	90.5	F. Irregular. T. Open, mealy, "acidy." C. Irregular. F. Cloths too long
194C	Molesworth Factory	43	26	13	4	86	F. Not clean; "off." T. Soft, pasty. C. Bleached. F. Fairly good; overheated
	Class M.—(Surprise Class.)—Four Loaf Cheeses, not more than 12 lbs. each, to be taken at random.						
196	Clachan Cheese Dairy	47	27.5	14.5	4	93	F. Fairly clean. T. Silky, but rather open and soft. C. Fairly good; clean. F. Fair
197	R. and J. Crothers, Wangoom ..	45	25	11	4	85	F. Not clean. T. Sour, "*acidy*," *crumbly*. C. Bleached and white. F. Fair

198	Grasmere Factory	44	27	13	3.5	87.5	F. "Off." T. Open, rough, sandy. C. Bleached. F. Bad; overheated
199	D. and J. McRae, Larpent ..	45	25	12	4	86	F. Not clean. T. Mealy, crumbly, "acidy." C. Bleached white. F. Fair
200	Alex. McRae, Larpent ..	46	26	13.5	3.5	89	F. Not clean. T. Weak and very open. C. Fair. F. Cheese bad shape; cloths too long
210	Wangerrip Cheese Factory ..	46	26.5	13	4	89.5	F. Irregular, one cheese of outstanding quality. T. One very good; irregular, "acidy." C. Irregular. F. Sizes uneven; overheated
210A	C. W. Meredith, Ondit.. ..	46.5	26	14	4	90.5	F. Not clean; rather much whey. T. Weak and open; rough. C. Irregular; too deep. F. Fair; cloths too long
211	G. F. Bartlett, Morwell ..	41	28	14	4.25	87.25	F. "Off"; too much whey. T. Fairly good and close; little corky. C. Even. F. Fairly good; cloths rather long
212	Cowwarr Cheese Factory ..	41	25	12	4	82	F. Rank; "off." T. "Acidy," mealy. C. Bleached. F. Fairly good
213	J. B. Hamono, Neerim South ..	43	26	13.5	4	86.5	F. Fruity; whey smell. T. Weak and open, sweet; insufficient acid. C. Deep. F. Good shape, but dirty
214	P. A. Olsen, Poowong	46.5	25	12	4	87.5	F. Not clean. T. "Acidy," too sour, crumbly. C. Bleached. F. Fair
215	James Reid, Tambo Upper ..	46	27.5	13.5	4	91	F. Ripe. T. Open and mealy. C. Fair. F. Cloths too long.
216	Thomas Riggall, Glenmaggie ..	45	26	13	3.75	87.75	F. Not clean. T. Soft, mushy, pasty. C. Very irregular. F. poor shape; cloths too long
217	Flowerdale Factory	45	25	12	4	86	F. Not clean. T. "Acidy" and mealy. C. Bleached. F. Cloths too long; rinds cracked
218	Molesworth Factory	39	24	12	4	79	F. Decidedly rank, being almost decomposed. T. Soft, mealy. C. Bleached. F. Fair, cloths too long; overheated
219	Emu Flat Factory	41	25	12	4	82	F. "Off." T. Mealy, "acidy," sour. C. Bleached. F. Fair; overheated

WOOD DISTILLATION: A NEW VICTORIAN INDUSTRY.

A. S. Kenyon, C.E., Engineer for Agriculture.

Settlement on the land implies the removal to a large extent of the original growths upon it. At times, and in particular localities, the timber may pay for its removal for saw-milling purposes; but as a rule, clearing, and particularly in the south-eastern districts, forms the heaviest and most costly part of pioneering work. The firm of Cuming, Smith and Co., manufacturers of artificial fertilizers, had, for many years, largely used acetic acid and its compounds in their chemical works. As this acid is produced (to use technical terms) by the destructive distillation of wood, Mr. James Cuming, Junr., considered it would be practicable to produce



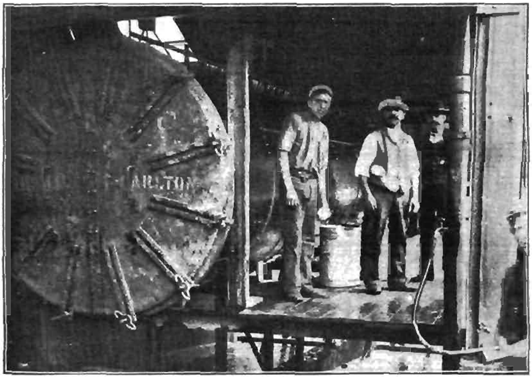
GENERAL VIEW OF THE WOOD DISTILLATION WORKS.

this, as well as other compounds, from the vast forests of Gippsland. A trip Home strengthened his convictions, and, as a result, some £40,000 have been spent in establishing wood distillation works at the Yarra Junction, near Warburton. The firm acquired several sawmills, and secured a lease from the Forest Department of about 4,000 acres on the Britannia Creek. A narrow gauge tramway was built connecting the saw-mills with the works, and with the railway. The timber is cleared off in a face, all of value being used for splitting palings or for the saw-mill; the remainder, down to limbs of 3 inches in diameter, is sent to the works. Dead wood is not used, the green living wood being required. It is not likely that the farmer will be able to undertake similar work to clear his land, the initial outlay being too high, yet a somewhat detailed description of the process may be of interest.

Wood distillation in its crudest form is known as charcoal burning. Here only one product, charcoal, is the objective, though very similar methods

are used in some countries to also obtain wood tars. In no case, however, can the gaseous products be secured. To obtain these and the solid and liquid products economically, retorts with the requisite condensing arrangements are required. Wood consists mainly of cellulose or woody fibre, and plant juice or sap. These are composed of carbon, hydrogen, oxygen, nitrogen, and a small amount of mineral matter. Under the influence of heat in the absence of air, that is, in a closed vessel or retort the cellulose and other matters are broken up, and new compounds formed, depending upon the degree of heat and the rapidity with which it is brought to bear on the vessel; a great deal also depends upon the care and skill used in applying the heat to the retorts.

The works themselves consist of a large shed for stacking the cut timber to permit of thorough drying, an operation occupying 6 to 12 months; retort and condensing house; laboratory and the usual residential buildings.



ONE OF THE COOLING CHAMBERS.

The timber is brought down on the tramway, stacked, and, when sufficiently dry, that is, with only some 10 per cent. of moisture, it is loaded on to trucks holding 3 tons each of green wood, equivalent, when dry, to a little over 2 tons. Four of these trucks constitute one charge for a retort, aggregating some 9 tons of dry wood. The trucks are run on to a cage-like traverser on rails, which is shaped to almost exactly fill the retort. The latter is a cylinder 46 feet in length, set in brick work like a boiler and heated in the same manner. Opposite to the retorts are the cooling chambers. These are identical in size and construction with the retorts, except that they are not built in. After the operation of distilling is complete, the door of the retort is opened and the traverser, a cage full of red hot charcoal, is rapidly run across into cooling chambers, and the doors closed to prevent the charcoal burning away in contact with the air. Streams of water play on the chambers to hasten the cooling process.

To return to the retorts; after the load is run in, the doors closed and luted up with clay to prevent escape of gases, firing is commenced, gently at the start, and harder towards the end, to get the right percentage of charcoal, which amounts to about 2½ tons per charge. The process occupies about twenty-two hours for dry, and up to thirty-six for green wood. The charcoal is practically pure carbon, the percentage of ash being about .5. From the retort the gases resulting from the distillation are sucked out by a fan or blower, there being a pressure to overcome in the tar separator. The gases go through a trough which has a system of water-pipes to keep the temperature down to about 150 deg. C. The tars separate at this temperature, and are collected in a copper separator, from the lower portion of which the tar flows continuously. The more volatile gases containing pyroligneous acid (the acetic acid group), wood naphtha or methyl alcohol, acetine, and a host of minor compounds of little value, are passed through a condenser, and the condensed liquid run into vats. These contain partitions for separating the wood oils distilled over, the heavier sinking to the bottom, and the lighter floating on top of the aqueous solution of wood naphtha and pyroligneous compounds. They are drawn off and run to the tar distillery, a cast iron kettle holding some 360 gallons of tar. The tar distillation secures some more acetic acid still remaining in it, and yields various oils such as creosote, well known as a meat and timber preservative. The volatile gases remaining unliquefied in the condenser are passed through scrubbing columns filled with coke and dripping water to extract any remaining wood spirit. After this, the gases are still of use to burn for heating purposes. When everything is working well, these gases are almost sufficient to supply all the heat required for the retorts, very little other fuel being needed. The water solution of wood spirit, &c., is run from its vat into neutralizing vessels. These are fitted with circular stirrers. Lime is put in until the free acetic and other acids are neutralized, and form lime acetates. From the neutralizing vessels the liquor is run into a sump where the heavier impurities in the lime, clay, sand, &c., are allowed to settle. It is then pumped through a filter press and raised to a de-alcoholizing or rectifying column, where, owing to its low boiling point 55 deg. C., the methyl alcohol is separated. The methyl alcohol product is kept at between 80 and 90 per cent. strength. The solution of acetate of lime is concentrated almost to saturation, using the waste steam from engine. It is then dried by blowers and rotary driers, producing grey acetate of lime in a dry state. From this either commercial or glacial acetic acid is produced by heating in a cast iron vessel with strong sulphuric acid.

This covers the present scope of the operations, but additions are contemplated to separate acetone for local use or for export. Acetone is a powerful solvent, and forms a most important constituent in some of the more recent high explosives used in warfare. From acetone, chloroform and iodoform are also derived. There is also a possibility of further by-products such as creosote compounds for wood, &c. The products of 1 ton of dry wood are:—

90 lbs. acetate of lime equal to 25 lbs. glacial acid worth 1s. lb.
25 lbs. methyl alcohol at 6d. lb.
70 lbs. Stockholm tar at ½d. lb.
5 cwt. charcoal at 1s. 6d. cwt.

equivalent to over £2 per ton in value.

The chemical portion of the plant is under the charge of Mr. Renckhoff, and the system adopted is that of F. H. Meyer, Hanover, Hainaults. About 200 hands are employed with a monthly wages sheet of over £1,000. The works were commenced in August, 1906, and are not yet in full working order.

TYPICAL STRINGY-BARK.

Every success must be wished such an important industry. The turning of practically worthless timber into products worth over £2 per ton is only accomplished by a large expenditure on labour, and, practically, on labour only. The advantages of manufacturing our own explosives are very great, although it is hoped we will not fully appreciate this side of the question for a considerable time. Such districts as the Otway and Heytesbury forests are peculiarly suitable for such industries, and with the assurance of profit from similar works large areas might be rendered available for the settler. In those localities, there are large stretches of grass tree country; the grass tree (*Xanthorrhœa Australis*) contains large percentages of sugar, varying from 10 to 18, and from these alcohol might be obtained by fermentation and direct distillation. There are other possibilities in the utilization of our apparently worthless forest products, and farmers generally will watch with interest the developments in this way.

GARDEN NOTES.

J. Cronin, Principal, School of Horticulture, Burnley.

The Aster.

Asters, or Michaelmas daisies as they are commonly termed, are perennial herbaceous plants blooming during the late summer and autumn months. The genus is a large one, over a hundred species being known. Most of the species are of little account as decorative plants for the garden, while others, and varieties raised from them, are worthy of a place in most gardens. The principal objection to many asters was their long and straggling habit of growth, but most of the kinds now generally grown are dwarf and compact. The range of colour is not wide; the majority of the species and their varieties produce flowers of shades of blue, lavender, and purple, a few bearing white flowers. The plants are hardy and very floriferous, and are specially suitable for mixed groups or borders where they supply a quantity of flowers of unusual and pleasing shades of colours at a time of comparative scarcity. The flowers are valuable for decoration, lasting well when cut from the plants.

ASTER BLOOMS.

The genus aster at one time included many shrubs, herbaceous perennials, and annuals, now referred to other genera, including *Callistephus* commonly known as the China aster. For the purpose of these notes the China aster may be referred to, as it is unlikely that it will be known under any other name than the present common one. A number of varieties of the China aster have been raised by florists, many of them being of exceptional merit. They are favorites with numerous gardeners,

amateur and professional, although their season of blooming is comparatively short. Many diverse forms are obtainable, and the general habit of growth of the best varieties is neat and compact. The flowers are valuable for decoration, lasting well in water.

Soil and Culture.

The cultivation of the perennial asters is exceedingly simple. They will thrive in any fair garden soil, having a preference for soil that will be cool and fairly moist during the growing season. They will grow fairly with a little attention in the matter of manuring and watering, but repay any special care in those directions. In fairly rich soils and situations, where they are allowed room to expand, they will not require to be removed and replanted for several years. In poor soils, and under hot and harsh conditions, it is advisable to lift the plants and transplant into manured soil each season. The usual method of increase is by division of the parent crown in autumn or spring. A small division will develop into a fairly large plant during the season of growth. Plants may be struck from cuttings in spring, but this method is rarely practised except by nurserymen when desiring a rapid increase of a scarce kind. New varieties are raised from seeds, which should be sown in light soil in spring. Seeds saved from some of the newer hybrid kinds may produce varieties varying in some respect from the parent. The general cultivation of the perennial aster during the growing season consists mainly in keeping the soil fairly moist during dry weather, and training the plants to stakes where necessary. Tall growing varieties may be cut back when about a foot in height, which will have the effect of dwarfing them a great deal. A number of varieties and species of aster are available in Melbourne nurseries.

The China asters are annuals, and must be raised each season from seeds. They are classed as half-hardy, a classification that denotes inability to resist normal winter conditions. Seeds should be sown in spring, September and October being the most suitable months for these and most other annuals of a like nature. To get good results, seed should be sown in boxes of light soil, and when the young plants are fit to handle they should be transplanted into boxes or beds and grown on for a time, when they should be transplanted into their flowering quarters. The first transplanting insures sufficient room for the development of the young plants; while, if left in the seed beds or boxes until the time came to transplant them into the beds or borders, they would unless sown very thinly be drawn and weakened. To attain something approaching perfection the China aster requires a good rich soil, well drained and prepared, and a fair supply of water during the growing season. Under suitable conditions some of the strains produce flowers of great size and beauty. Where water is scarce a mulching of manure will assist materially in the development of the plants. After the flower buds are formed it is advisable to withhold water in a measure as the flowers are liable to "damp off."

Flower Garden.

Preparing ground for planting during the dormant season, and the present planting of evergreen and other plants from pots are important operations at this season. The work of soil preparation can be carried out more thoroughly and the soils and manures be better and more easily mixed when the soil is in a partly dry condition than in a state of saturation. A common error with novices in gardening is the burying of

the surface soil when preparing beds for the reception of plants. Deep working is necessary, and the addition of manure or other soil to the substratum is also necessary, but the surface soil turned and mixed should always be reserved and replaced at the surface or top spit, no matter what depth the trenching, digging, or other preparation is done. The soil will be settled by the rain after autumn preparation, and be fitted to receive plants during winter under conditions that will conduce to successful cultivation.

The benefits of autumn planting of shrubs, trees, and other plants that will resist frost, have been previously referred to in these notes. Briefly, the advantage of early planting is that the roots take readily to the warm moist soil, and supply nutriment to the plants that enables them to become fairly established before the hot summer weather begins. *It is especially important where a supply of water for the garden is limited*, or where the weather conditions during summer are severe.

Chrysanthemums grown for exhibition blooms should not receive liquid manure after the flowers begin to expand their petals. The application after that time would not be likely to benefit the flowers, and would undoubtedly have a tendency to promote "damping" of the petals. Raising chrysanthemums from seeds is a favorite phase of gardening with many cultivators, amateur and professional. Seeds may be purchased at times, but generally the results are disappointing unless some special "strain" specially selected can be procured. It is in the power of most gardeners to save seeds from fine varieties that will be likely to produce something of value. The plants likely to produce seeds are not those specially grown for exhibition, but those grown for border decoration. A little thinning of the terminal bunch of buds is advisable, and cross-fertilizing with other kinds can be easily accomplished. The disc or "centre" should be showing in the flowers otherwise seed will not be available. The usual plan adapted by growers of seedlings is to grow a few plants of special varieties together for seed purposes. The petals of the flowers are cut off with a scissors, and as the pollen ripens it is transferred to other plants to assist in the fertilization and also to cross the varieties. The seed ripens about July and should be cleaned and reserved for sowing until spring.

Plants of hardy annuals raised earlier from seeds should be transferred to their flowering quarters.

Kitchen Garden.

Preparation of the soil for future planting, and planting perennial vegetables and herbs are important operations. As in the flower garden, thorough preparation is necessary in order to produce good results. As a rule the working of the soils of kitchen gardens is more carefully and thoroughly done than in the case of flower borders. Beds for the reception of asparagus should be prepared. To grow asparagus satisfactorily a rich and fairly porous soil, deeply worked, drained and manured is required. Young seedling plants are preferable to divisions of the old plants, and should be planted during the dormant season.

Seeds of onion may be sown to use green in spring or for transplanting in June for early bulbs. Early Golden Globe is one of the best early varieties. Sowings may be made of early peas, broad beans, cabbage (early varieties), and saladings. Plants raised from seeds may be set out as required.

GRANT TO AGRICULTURAL SOCIETIES.

CONDITIONS TO BE CARRIED OUT BY AGRICULTURAL SOCIETIES RECEIVING A GRANT FOR THE YEAR 1ST JULY, 1908, TO 30TH JUNE, 1909.

A.—That the awards of prizes in all classes for stallions three years old and over at the Society's Show must be subject to the possession by the exhibit of a Government certificate of soundness. (See details in accompanying circular of information.)

The examinations of stallions for the Government Certificate of Soundness will not be made at Shows in the future. Stallion Inspection Parades will be held at 100 different centres throughout the State prior to the commencement of the Show season, and on dates set out in the accompanying time table. The centres are so arranged that all owners of Show stallions will have the opportunity of submitting them for examination for the Government Certificate of Soundness. Attention is invited to a careful perusal of the accompanying Circular of Information concerning the holding of the Stallion Inspection Parades, and the conditions under which the Government Certificate of Soundness is issued. Show Secretaries or Stewards will require to obtain evidence of the possession of the Government Certificate in respect of exhibits, either at the time of entry or prior to judging. The list of all Stallions certificated up to March 31st is published herewith, and this list will be supplemented from time to time in order that Show Secretaries may have some guidance as to stallions eligible for prizes.

At the close of the season, when forwarding the particulars required before payment of a subsidy can be made, Secretaries of Societies will require to forward the names of all prize winners in stallion classes, together with the names of the owners.

B.—That the Society arrange for:—

(1) The holding of agricultural students' classes; or
(2) The holding of a series of at least four lectures or demonstrations on agricultural or live stock matters.

(B.1) Agricultural Classes.—The agricultural classes will last a fortnight, two lectures and demonstrations being given each afternoon, and four limelight lectures on evenings to be arranged for by the Secretary of each Society. Thirty students at least must be enrolled before a class can be held. The rent of hall and all local charges are to be paid by the Agricultural Society; all other expenses by the Department. Arrangements must be made to insure the uninterrupted use of the hall during the time the lectures are going on, and tables or desks provided so that students may take notes. The conditions under which medals and prizes are awarded to the students are to be subject to approval by the Department.

Subjects of First Week.

The Principles of Agriculture.
The Care of Farm Animals.

Subjects of Second Week.

Two or more of the following, to be selected by the Department:—(*a*) Sheep Breeding and Management (including Wool Classing and Lambs for Export); (*b*) Dairy Farming; (*c*) Poultry Breeding and Management; (*d*) Agricultural Engineering; (*e*) Orchard and Garden Work.

SYNOPSIS OF LECTURES.

(Five of these lectures will be given in each course. The one considered least important for local conditions will be omitted.)

PRINCIPLES OF AGRICULTURE.

1. The plant food of the soil.
2. Cultivation methods and management.
3. Principles of manuring.
4. Valuation of artificial manures.
5. The management of the farm.
6. Experimental plots and their lessons.

Evening Lecture.—The Agricultural Resources of Victoria.

THE CARE OF FARM ANIMALS.

1. The structure and care of the horse's foot.
2. Brood mares and breeding mishaps.
3. Colic, constipation, and other bowel complaints.
4. Ailments of dairy cows—milk fever, impaction, udder complaints.
5. Some notifiable diseases—abortion, blackleg, tuberculosis, &c.
6. Ailments of swine, or ailments of sheep.

Demonstrations.

1. Examinations for age, lameness, and unsoundness.
2. Horse shoes and their uses—practical shoeing.

Evening Lecture.—(Lantern)—Unsoundness in Horses.

SHEEP BREEDING AND MANAGEMENT.

1. The breeding of sheep for wool.
2. Wool sorting and classing, No. 1.
3. Wool sorting and classing, No. 2.
4. Raising fat lambs.
5. Management of flocks.

Evening Lecture.—The Wool Industry.

DAIRY FARMING.

1. Breeding and management.
2. Dairy buildings.
3. Dairy management.
4. Milk testing.
5. Foods and feeding.
6. Pig breeding, &c.

Evening Lecture.—Exported Products.

POULTRY BREEDING AND MANAGEMENT.

1. The poultry industry: its importance. Locality—suitability or otherwise.
2. Housing (construction of, materials, insect proof, aspect, &c.). How to select stock.
3. Breeds: payable or otherwise, eggs and table. Breeds adapted for export—modes of crossing.
4. Turkeys: their care and management. Chicken raising and care.
5. Foods and feeding (practically demonstrated).
6. Common ailments of poultry (with demonstrations when necessary). Incubation—natural and artificial.

Evening Lecture.—Descriptive of Victoria's Progress during the last three years. (Illustrated with 90 lantern slides.)

AGRICULTURAL ENGINEERING.

1. Water conservation.
2. Irrigation.
3. Drainage.
4. Surveying and measuring.
5. Levelling and setting out.
6. Silo construction, making and using silage.

Evening Lecture.—Irrigation in Victoria.

ORCHARD AND GARDEN WORK.

1. Fruit growing: sorts and localities.
2. Manuring and cultivation.
3. Pruning and management.
4. Insect pests.
5. Fungus diseases.
6. The farmer's garden.

Evening Lecture.—The Fruit Industry.

(B.2) LECTURES ON AGRICULTURAL SUBJECTS.—Many of the lectures are illustrated by limelight views. The hall, advertising, &c., must be provided locally, free of cost, but all other charges are borne by the Department.

The course shall consist of at least four lectures or practical demonstrations during the year, and the Society must take sufficient interest in the matter to insure a good attendance. It is requested that application be made as early as possible, so as to permit of a complete syllabus being drawn up, and the subjects of most interest to the district are to be mentioned. The Department will arrange for the lecture to be delivered as nearly as possible on the date mentioned by the Society, but modifications may be necessary in order to carry out the complete programme. The day of the week most suitable for each locality should be mentioned.

Societies may arrange for lectures by experts other than Departmental officers, but the subject and lecturer must be notified to and approved of by the Department. Any of the following subjects may be chosen:—

SUBJECTS AND STAFF.

Veterinary Science, Stock Management, Dairy Sanitation and Education—Messrs. Cameron, Colebatch, Robertson, Cother, and Strong.

Agricultural Engineering, Surveying, Irrigation, Silos—Mr. Kenyon.

Principles of Agriculture, Manures, Cereal Culture—Messrs. Lee, Colebatch, and Temple Smith.

The Dairying Industry and Export Trade—Messrs. Crowe, Archer, and Carroll.

Orchard and Garden Work—Messrs. Cronin and Carmody.

Sheep Breeding and Management—Mr. H. W. Ham.

Lambs for Export—Dr. Brown.

Flax Culture and Demonstrations at Shows—Mr. Knight and staff.

Poultry Breeding and Management—Messrs. Hart and Hawkins.

Potato Culture—Mr. Seymour.

Tobacco Culture—Mr. Temple Smith.

Pig Breeding and Management—Mr. W. Smith.

Fruit Industries—Mr. J. G. Turner.

Insect Pests—Mr. C. French, Junr.

Plant Diseases and Pests—Mr. McAlpine.

C.—That the Society—

(1) arrange for the carrying out of field experiments on an area and in a locality to be approved by the Department; or

(2) provide and offer a substantial prize (the amount to be approved by the Minister of Agriculture, but not less than five pounds) for improvements in farm practice and management, or the cultivation of special crops in the district.

(C.1) Experimental Plots.—The plot of land should be about 5 acres in extent, so that the amount of produce may be of value to the Society. It is desirable also that arrangements be made for the use of the land for a number of years, so that a definite scheme can be worked out; the Society to furnish the land, with a written guarantee from the owner that it will be available free of charge to the Department, members of the Society to plough, harrow, and do the main part of the cultivation. The Department will supply the manures and the seed free of cost, and superintend the sowing and harvesting, two-thirds of the produce to belong to the Society, and one-third to the Department. A committee of the Society to be appointed to arrange the details of the work in conference with an officer of the Department. This committee to inspect the crops at stated intervals, and to sign the report drawn up by the officer of the Department.

It is suggested that one or more experimental plots should be developed in each district. Three main lines of investigation may be carried out; first, the determination of the manurial requirements of the district; second, the introduction of new methods of management and of new crops; third, by introducing new varieties of crops not already grown in the district. The area of land selected should be typical of the district, if anything, rather on the poor side. The location of the plot should be such that it can be seen by as many farmers as possible. An area adjacent to the principal town, or close to the railway station of the district, is therefore suggested. The details of the experimental work carried on by the Department are published from time to time in the *Journal*, and will be furnished for the information of members on application to the Secretary for Agriculture.

In the case of those Societies which select experimental potato plots, it is requested that the Department be notified, and the site offered before 31st March each year. All such sites are subject to approval.

(C.2) Special Prize.—In carrying out this section, the words "substantial prize" are to be interpreted in proportion of the income and prize list of the Society. It should amount to from 2½ to 5 per cent. of the total amount distributed in prizes at the show. The objects aimed at should be to make a distinct advance in farming methods as carried on in the district, and it will therefore be advisable to state the amount of the prize and the purpose for which it will be awarded several years in advance. Several Societies at present award prizes for the best-managed farms under and over 200 acres; others for the best farm under irrigation. These Societies fulfil all the conditions required. Suitable subjects are—(*a*) The best 10 acres irrigated by a private scheme; (*b*) The best 5 acres of lucerne, maize, or other fodder crops grown with or without irrigation; (*c*) The best-managed dairy herd of ten cows or upwards; or (*d*) The best 5-acre crop of flax or beans, &c., &c. Two or three objects should be suggested by each Society in taking up this condition. The Department will, as far as possible, assist by arranging the details of the competition, give instruction as to the best methods in attaining the object sought, and, if required, an officer of the Department will judge the competition, and a full report, with criticisms and suggestions for improvement, will be forwarded along with the award.

Circular of Information concerning the Holding of Parades for the

VETERINARY INSPECTION OF STALLIONS

FOR THE

GOVERNMENT CERTIFICATE OF SOUNDNESS AND APPROVAL.

One of the conditions to be carried out by all Agricultural Societies receiving Government subsidies in any form in future is that a Government Certificate of Soundness and Approval shall have been issued in respect of all Stallions three years old or over competing for prizes at the Shows held by the societies.

In order that all societies throughout the State may be assisted in conforming with this condition, it becomes necessary to arrange for the holding of Stallion Inspection Parades in such manner and at such centres as will provide the opportunity for all stallions likely to compete for prizes at Shows to be submitted for Veterinary Inspection for the Government Certificate, prior to the holding of Shows.

Fifty-six parades were held last season in different parts of the State on dates arranged by the societies, and with a staff of four Veterinary Surgeons continuously engaged, it was found somewhat difficult to get through with the work. It is found that about 100 parades will require to be held this season if all societies and districts are to be catered for.

To provide, as far as possible, for uniformity in the method and standard of examination, it has been decided to limit the work to three of the most experienced officers in the Department—Messrs. Cameron, Colebatch, and Robertson. (Mr. McDonald, whose services were gladly availed of last year, will be in England during the forthcoming season.)

Time Table.

Consequent on these two necessities—the doubling of the Parades, and the decrease of the Staff engaged, it is proposed that the Parades be held at places and times arranged by the Department, and along with this Circular, is a Time Table relating to the Parades it is proposed to hold in your district. It is not suggested—unless it meets with the wishes of your Society—that these Inspection Parades shall take the place of the Stallion Parades which your Society has possibly been in the habit of holding, but, of course, it is obvious that if the two objects can be served on the same date, less inconvenience will be occasioned to owners. The fullest consideration has been given to the arrangement of the Time Table, so as to provide an average of six Parades per week to be attended by each Officer, and it is hoped that all societies will, as far as possible, fall in with the Time Table and make arrangements accordingly. The Time Table has been compiled on the basis of the winter Railway Time Table for last year. It is possible, of course, that this winter's Time Table may be different, but it is not thought that the times and dates will be materially interfered with.

As was the case last year, the Parades will be conducted without expense to the societies, other than that involved in making known the occasion to the Stallion owners in the districts, which function it is hereby requested the Society should undertake.

In the event of it being found impossible for local reasons to hold the Parade in any district at the time and date set out in the Time

Table, notice to this effect—together with suggestions for alternative date and time compatible with the rest of the Time Table—should be given *not later than 1st June*, after which no alteration in the Time Table can be made.

GROUNDS FOR REJECTION.

The attention of the members of your Society is invited to the report *on the Veterinary Examination of Stallions during the 1907 season*, see *Journal* for December, 1907, and which gives results to date. It is particularly desired that owners of stallions should understand that only those hereditary unsoundnesses which are set out in the report, will constitute a cause for refusal of the certificate on the ground of unsoundness. All other blemishes or unsoundness, or defects of conformation, the result of accident, external injury, and over-strain and over-work, will not disqualify.

The certificate is also refused in the case of animals below a reasonable standard for Government approval, as regards type, conformation, and breed.

ISSUE OF CERTIFICATES.

Particulars concerning the identity of the horse—name, pedigree, age, etc.—should be furnished to the examining officer at the time of examination, either verbally or by way of the usual stallion advertisement.

Certificates will be issued within seven days of the holding of the parades, and will be forwarded to the secretaries of the societies, under whose auspices the parades are held, and who will either forward them to the owner direct, or on application. Until the issue of a certificate, or until the publication of the official list of certificated stallions, the result of the veterinary examination will not be communicated to any person. The examining officer, if he shall see fit to do so, may communicate to the owner or his agent—duly authorized in writing to inquire—the result of the examination. In case of refusal of the certificate the reasons for refusal will not under any circumstances, save in legal proceedings under the direction of the Court, be communicated to any person except the owner or his agent duly authorized in writing, and to these only on request in writing. Secretaries of societies, persons in charge of the horse, grooms or relatives of the owner will not be considered authorized agents for that purpose unless they deliver to the officer the owner's signed authority to receive the information.

TENURE OF CERTIFICATE.

Certificates are issued in respect of stallions three years old and over *only*.

Certificates that have been issued during the season 1907, and certificates that will be issued during the season 1908 will be regarded as life certificates.

In 1909, only stallions *four* years old and over, will be given life certificates. *Three-year-old* stallions will be certificated for the season only, and will be required to be submitted for *re*-examination each season, *until five* years old, when a life certificate will be issued.

In 1910, and subsequently, only stallions *five* years old and over, will be given life certificates. *Three-year-old* and *four-year-old* stallions will be certificated for the *season only*, and will be required to be submitted for *re*-examination each season *until five* years old, when a life certificate will be issued.

The Minister retains the right to at any time have a certificated stallion submitted for re-examination, and to withdraw the certificate, in the event of the animal being declared, to his satisfaction, unsound.

The arrangement as to tenure of certificates, set out above, provides for the introduction of the system gradually, so that no hardship will be imposed on owners.

Unless in response to Ministerial request as above provided for, owners at present in possession of *matured* stallions will require to submit them for examination *once only;* and those purchasing stallions certificated in 1907 and 1908, will *not* require to submit them again. Persons undertaking stallion keeping *after* 1908 will have had ample notice, and will have full knowledge of the conditions to which their stallions will be subjected, namely—the annual examination of all horses *under five years old.*

COURT OF APPEAL.

Any owner of a stallion who is dissatisfied with the refusal of a certificate in respect of his horse may appeal against the decision to the Minister at any time within *thirty* days of the examination, under the following conditions:—

(*a*) That the appeal is in writing and is accompanied by the lodgment of £10 10s., such amount to be forfeited in the event of the appeal *not* being upheld.

(*b*) That the appeal is accompanied by an undertaking to pay any railway fares and hotel expenses incurred by the Court of Appeal in connection with the settlement of the appeal.

(*c*) That, in the event of refusal having been on the ground of unsoundness, the appeal is accompanied by a certificate from a registered Veterinary Surgeon setting out that the horse has been found by him to be free from all the following forms of unsoundness, viz.:—Broken wind, Roaring, Cataract (eye), Nasal Disease (osteo-porosis), Ringbone, Sidebone, Bone-spavin, Bog-spavin, Curb, Thoroughpin and bursal enlargements.

(*d*) That, in the event of refusal having been on the ground of being below standard for Government approval, the appeal is accompanied by a certificate from the President and two members of the Committee of the Society under whose auspices the parade was held, setting out that in their opinion the horse is of a fit and proper type, conformation, and breed to be approved as a stud sire.

On receipt of Notice of Appeal in proper form, and with the above conditions complied with, the Minister will appoint a Court of Appeal, which shall consist of:—

(*a*) In the case of appeals against refusal of certificate on the ground of unsoundness, the Chief Veterinary Officer and two practising veterinary surgeons.

(*b*) In the case of appeals against refusal of certificate as being below standard for Government approval, the Chief Veterinary Officer and two horsemen of repute and standing.

Such Court will act and decide on the appeal, and its decision shall be final, and *not subject* to *review.*

The Minister may, on the recommendation of the Court, allow a successful appellant the whole, or such portion as he may decide, of the expenses of the appeal.

No stallion in respect of which a Government certificate is refused will be allowed to be re-submitted for examination except in the case of an appeal as herein provided for.

STALLION INSPECTION PARADES—SEASON, 1908.

Time Table for Week—July 20th to 25th.

WIMMERA DISTRICT (No. 1).

Veterinary Officer: S. S. Cameron, M.R.C.V.S.

Date.	Place.	Time.	Officer Arrives.	Officer Leaves.
Monday, 20th July . .	Stawell . .	3 p.m.	2.38 p.m. . .	10.27 p.m.
Tuesday, 21st July . .	Goroke . .	2 p.m.	Noon (driving)	4 p.m. (driving)
Wednesday, 22nd July	Horsham . .	2 p.m.	Driving (21st July)	6.21 p.m.
Thursday, 23rd July	Kaniva . .	2 p.m.	11.5 p.m. (22nd July)	12.42 a.m. (24th July)

NORTH-WESTERN DISTRICT (No. 1).

Veterinary Officer: W. J. Colebatch, M.R.C.V.S.

Date.	Place.	Time.	Officer Arrives.	Officer Leaves.
Tuesday, 21st July . .	Wycheproof . .	10 a.m.	6 p.m. (20th July)	Noon (driving)
" " . .	Birchip . .	2.30 p.m.	2 p.m. . .	5 p.m. (driving)
Wednesday, 22nd July	Sea Lake* . .	2 p.m.	12.25 p.m. . .	7 a.m. (23rd July)
Thursday, 23rd July	Charlton* . .	2 p.m.	11.58 a.m. . .	12.25 p.m. (24th July)

NORTH-WESTERN DISTRICT (No. 2.)

Veterinary Officer: W. A. N. Robertson, G.M.V.C.

Date.	Place.	Time.	Officer Arrives.	Officer Leaves.
Tuesday, 21st July . .	Boort . .	10 a.m.	4.55 p.m. (20th July)	1 p.m. (driving)
Wednesday, 22nd July	Pyramid . .	12 noon	Evening (21st July), driving	3.18 p.m.
Thursday, 23rd July	Swan Hill* . .	2 p.m.	7.5 p.m. (22nd July)	10.25 a.m. (24th July)
Friday, 24th July . .	Kerang* . .	2 p.m.	12.4 p.m. . .	5.50 a.m. (25th July)

*** At places marked with an asterisk a lantern lecture on "Unsoundness in Horses" can be given on the evening of the Inspection Parade if desired and arranged by the Agricultural Society.**

TIME TABLE FOR WEEK—AUGUST 3RD TO 8TH.

GOULBURN VALLEY DISTRICT.

VETERINARY OFFICER: S. S. CAMERON, M.R.C.V.S.

Date.	Place.	Time.	Officer Arrives.	Officer Leaves.
Monday, 3rd Aug. ..	Nathalia* ..	2 p.m.	1.30 p.m. ..	9 a.m., (4th Aug.), driving
Tuesday, 4th Aug. ..	Numurkah* ..	2 p.m.	11 a.m. ..	12.43 p.m. (5th Aug.)
Wednesday, 5th Aug.	Cobram ..	2.15 p.m.	2.7 p.m. ..	3.15 p.m., or driving
Thursday, 6th Aug...	Murchison ..	10 a.m.	9 a.m. ..	Noon, driving
,, ,,	Tatura* ..	3 p.m.	2 p.m., driving	9 a.m. (7th Aug.), driving
Friday, 7th Aug. ..	Shepparton* ..	2 p.m.	11 a.m., driving	12 noon (8th Aug.)
Saturday, 8th Aug...	Dookie ..	1 p.m.	12.55 p.m. ..	4.16 p.m.

NORTH-EASTERN DISTRICT (No. 1).

VETERINARY OFFICER: W. J. COLEBATCH, M.R.C.V.S.

Date.	Place.	Time.	Officer Arrives.	Officer Leaves.
Monday, 3rd Aug. ..	Benalla ..	3 p.m.	11.25 a.m. ..	8.50 p.m.
Tuesday, 4th Aug. ..	Tungamah ..	12 noon	10.31 p.m. (3rd Aug.)	3.28 p.m.
Wednesday, 5th Aug.	Wangaratta ..	3 p.m.	9.17 p.m. (4th Aug.)	9.23 p.m.
Thursday, 6th Aug.	Rutherglen ..	12 noon	10 a.m., driving	3.22 p.m.
Friday, 7th Aug. ..	Euroa ..	3 p.m.	6.32 p.m. (6th Aug.)	6.32 p.m.

NORTH-EASTERN DISTRICT (No. 2).

VETERINARY OFFICER: W. A. N. ROBERTSON, G.M.V.C.

Date.	Place.	Time.	Officer Arrives.	Officer Leaves.
Monday, 3rd Aug. ..	Heathcote ..	2 p.m.	11.41 a.m. ..	5.41 p.m.
Tuesday, 4th Aug. ..	Kilmore ..	1 p.m.	8.21 p.m. (3rd Aug.)	4 p.m., driving
Wednesday, 5th Aug.	Bright* ..	4.15 p.m.	4.8. p.m. ..	5.40 a.m. (6th Aug.)
Thursday, 6th Aug...	Yackandandah	10.30 a.m.	10.22 a.m. ..	1 p.m., driving
Friday, 7th Aug. ..	Tallangatta* ..	2 p.m.	4.35 p.m. (6th Aug.)	6.15 a.m. (8th Aug.)

Time Table for Week—August 10th to 15th.

WIMMERA DISTRICT (No. 2).

Veterinary Officer: S. S. Cameron, M.R.C.V.S.

Date.	Place.	Time.	Officer Arrives.	Officer Leaves.
Tuesday, 11th Aug.	Rainbow ..	1.40 p.m.	1.35 p.m. ..	3 p.m.
Wednesday, 12th Aug.	Dimboola ..	2 p.m.	6.20 p.m. (11th Aug.)	10.20 a.m. (13th Aug.)
Thursday, 13th Aug.	Jeparit ..	2 p.m.	11.43 a.m. ..	4.47 p.m.
Friday, 14th Aug. ..	Nhill ..	2 p.m.	9.8 p.m. (13th Aug.)	1.31 a.m. (15th Aug.)

NORTH-EASTERN DISTRICT (No. 3).

Veterinary Officer: W. J. Colebatch, M.R.C.V.S.

Date.	Place.	Time.	Officer Arrives.	Officer Leaves.
Monday, 10th Aug...	Yea* ..	3 p.m.	10.15 a.m. ..	10.35 a.m. (11th Aug.)
Tuesday, 11th Aug.	Mansfield ..	2 p.m.	1.58 p.m. ..	3.35 p.m.
Wednesday, 12th Aug.	Alexandra ..	2 p.m.	1 p.m., coach	4.30 p.m.
Thursday, 13th Aug.	Seymour* ..	2 p.m.	8.59 p.m. (12th Aug.)	7.30 a.m. (14th Aug.)
Friday, 14th August	Romsey ..	2 p.m.	Noon, driving	5.25 p.m.

WIMMERA (No. 3).

Veterinary Officer: W. A. N. Robertson, G.M.V.C.

Date.	Place.	Time.	Officer Arrives.	Officer Leaves.
Tuesday, 11th Aug.	Murtoa ..	2 p.m.	11.27 p.m. (10th Aug.)	6.10 p.m.
Wednesday, 12th Aug.	Warracknabeal*	2 p.m.	8.10 p.m. (11th Aug.)	6.45 a.m. (13th Aug.)
Thursday, 13th Aug.	Hopetoun ..	9.30 a.m.	9.25 a.m. ..	11.30 a.m.
.. ..	Beulah ..	1 p.m.	12.25 p.m. ..	4 p.m., driving
Friday, 14th Aug. ..	Minyip* ..	1 p.m.	10.43 a.m. ..	10 p.m., driving

TIME TABLE FOR WEEK—AUGUST 17TH TO 22ND.

WESTERN DISTRICT (No. 1).

VETERINARY OFFICER: S. S. CAMERON, M.R.C.V.S.

Date.	Place.	Time.	Officer Arrives.	Officer Leaves.
Monday, 17th Aug...	Colac ..	2 p.m.	10.41 a.m. ..	8.19 p.m.
Tuesday, 18th Aug.	Port Fairy ..	10 a.m.	12.57 a.m. ..	1.15 p.m.
,, ,,	Warrnambool	3 p.m.	2.57 p.m. ..	7.1 a.m. (19th Aug.)
Wednesday, 19th Aug.	Camperdown ..	10 a.m.	8.44 a.m. ..	12.14 p.m.
,, ,,	Terang ..	2 p.m.	12.46 p.m. ..	4.43 p.m.
Thursday, 20th Aug.	Geelong ..	2 p.m.	9 p.m. (19th Aug.)	8.5 a.m. (21st Aug.)
Friday, 21st Aug. ..	Werribee ..	10 a.m.	8.54 a.m. ..	1.22 p.m.

MIDLAND DISTRICT (No. 1).

VETERINARY OFFICER: W. J. COLEBATCH, M.R.C.V.S.

Date.	Place.	Time.	Officer Arrives.	Officer Leaves.
Monday, 17th Aug.	Dunolly ..	2 p.m.	1.46 p.m. ..	7.13 p.m.
Tuesday, 18th August	St. Arnaud ..	1 p.m.	9.4 p.m. (17th Aug.)	3.57 p.m.
Wednesday, 19th Aug.	Donald ..	10 a.m.	5.15 p.m. (18th Aug.)	12.25 p.m.
Thursday, 20th Aug.	Castlemaine ..	10 a.m.	7.25 p.m. (19th Aug.)	12.56 p.m.
,, ,,	Kyneton* ..	3 p.m.	1.50 p.m. ..	8.32 a.m. (21st Aug.)
Friday, 21st Aug. ..	*Daylesford* ..	*1 p.m.*	*11.50 a.m.* ..	*3.30 p.m.*

NORTH GIPPSLAND (No. 1).

VETERINARY OFFICER: W. A. N. ROBERTSON, G.M.V.C.

Date.	Place.	Time.	Officer Arrives.	Officer Leaves.
Monday, 17th Aug...	Traralgon ..	2 p.m.	12.10 p.m. ..	9.15 p.m.
Tuesday, 18th Aug.	*Sale* ..	*2 p.m.*	11.25 p.m. (17th Aug.)	*10.45 p.m.*
Wednesday, 19th Aug.	Bairnsdale ..	11 a.m.	12.18 a.m. ..	2.15 p.m.
Thursday, 20th Aug.	Warragul* ..	2 p.m.	7.25 p.m. (19th Aug.)	10.55 a.m. (21st Aug.)
Friday, 21st Aug. ..	Berwick* ..	2 p.m.	12.16 p.m. ..	8.5 a.m. (22nd Aug.)

Time Table for Week—August 24th to 29th.

MIDLAND DISTRICT (No. 2).

Veterinary Officer: S. S. Cameron, M.R.C.V.S.

Date.	Place.	Time.	Officer Arrives.	Officer Leaves.
Monday, 24th Aug.	Bacchus Marsh	2 p.m.	8.55 a.m. ..	5.49 p.m.
Tuesday, 25th Aug.	Ballarat ..	2 p.m.	7.25 p.m. (24th Aug.)	8 p.m.
Wednesday, 26th Aug.	Maryborough	10 a.m.	10.20 p.m. (25th Aug.)	12.55 p.m.
" "	Clunes ..	3 p.m.	1.43 p.m. ..	7.52 p.m.
Thursday, 27th Aug.	Ballan ..	2 p.m.	8.23 a.m. ..	6.33 p.m.
Friday, 28th Aug ..	Ararat ..	1 p.m.	9.35 p.m. (27th Aug.)	4.13 p.m.

WESTERN DISTRICT (No. 2).

Veterinary Officer: W. J. Colebatch, M.R.C.V.S.

Date.	Place.	Time.	Officer Arrives.	Officer Leaves.
Monday, 24th Aug...	Beaufort ..	2 p.m.	12.27 p.m. ..	7.15 p.m.
Tuesday, 25th Aug.	Portland* ..	2 p.m.	1.2 p.m. ..	8.25 a.m. (26th Aug.)
Wednesday, 26th Aug.	Condah ..	2 p.m.	10.14 a.m. ..	5.30 p.m., driving
Thursday, 27th Aug.	Casterton ..	10 a.m.	8.45 p.m. (26th Aug.)	Noon, driving
" "	Coleraine* ..	3 p.m.	2 p.m., driving from Casterton	10.15 a.m. (28th Aug.)
Friday, 28th Aug. ..	Hamilton ..	2 p.m.	11.35 a.m. ..	6.7 p.m.

NORTH MIDLAND DISTRICT.

Veterinary Officer: W. A. N. Robertson, G.M.V.C.

Date.	Place.	Time.	Officer Arrives.	Officer Leaves.
Monday, 24th Aug...	Kyabram* ..	3 p.m.	1.2 p.m. ..	1.2 p.m. (25th Aug.)
Tuesday, 25th Aug...	Echuca* ..	3 p.m.	2.10 p.m. ..	8 a.m. (26th Aug.)
Wednesday, 26th Aug.	Elmore ..	11 a.m.	9.22 a.m. ..	1 p.m., driving
" "	Rochester* ..	3 p.m.	2.20 p.m. ..	8.45 a.m. (27th Aug.)
Thursday, 27th Aug.	Inglewood ..	2 p.m.	1.37 p.m. ..	4.20 p.m.
Friday, 28th Aug. ..	Maldon ..	12 noon	11.35 a.m. ..	3 p.m.

TIME TABLE FOR WEEK—SEPTEMBER 7TH TO 12TH.

SOUTH GIPPSLAND.

VETERINARY OFFICER: W. J. COLEBATCH, M.R.C.V.S.

Date.	Place.	Time.	Officer Arrives.	Officer Leaves.
Monday, 7th Sept. ..	Yarram* ..	4 p.m.	3.45 p.m. ..	10.55 a.m. (8th Sept.)
Tuesday, 8th Sept...	Foster* ..	3 p.m.	2.5 p.m. ..	2.20 p.m. (9th Sept.)
Wednesday, 9th Sept.	Leongatha* ..	4 p.m.	4.1 p.m. ..	7.20 a.m. (10th Sept.)
Thursday, 10th Sept.	Korumburra*..	2 p.m.	7.59 a.m. ..	8.20 a.m. (11th Sept.)
Friday, 11th Sept. ..	Lang Lang ..	2 p.m.	9.23 a.m. ..	6.3 p.m.

NORTH GIPPSLAND (No. 2).

VETERINARY OFFICER: W. A. N. ROBERTSON, G.M.V.C.

Date.	Place.	Time.	Officer Arrives.	Officer Leaves.
Monday, 7th Sept. ..	Maffra* ..	2 p.m.	1.46 p.m. ..	10 p.m., driving
Tuesday, 8th Sept...	Morwell ...	10 a.m.	9.26 a.m. ..	12.20 p.m.
,, ,,	Mirboo North	2 p.m.	2 p.m. ..	4.15 p.m.
Wednesday, 9th Sept.	Bunyip ..	2 p.m.	8.19 p.m. (8th Sept.)	8.19 p.m.
Thursday, 10th Sept.	Dandenong ..	2 p.m.	9.30 p.m. (9th Sept.)	7.43 a.m. (11th Sept.)
Friday, 11th Sept. ..	Cranbourne ..	2 p.m.	8.1 a.m. ..	6.56 p.m.

METROPOLITAN DISTRICT & MISCELLANEOUS.

VETERINARY OFFICERS { S. S. CAMERON, M.R.C.V.S.
W. J. COLEBATCH, M.R.C.V.S.
W. A. N. ROBERTSON, G.M.V.C.

Date.	Place.	Time.	Officer Arrives.	Officer Leaves.
Monday, 14th Sept.	Frankston ...	3 p.m.	2.34 p.m. ...	6.2 p.m.
Tuesday, 15th Sept.	Whittlesea ...	2 p.m.	12.45 p.m. ...	8 p.m.
Wednesd'y, 16th Sept.	Bendigo ...	2 p.m.	11.22 p.m. ...	6.50 p.m.
Thursday, 17th Sept.	Lilydale ...	2 p.m.	1.34 p.m. ...	6 p.m.
Friday, 18th Sept.	Melton ...	10 a.m.	8.35 a.m. ...	1.21 p.m.

On Saturday and Monday, July 25th and 27th, Inspection Parades will be held at Melbourne. Time—11 a.m. to 4.30 p.m.

On every Saturday, from July 25th onwards, during the season, stallions may be submitted for examination at the Agricultural Offices, Spring-street, Melbourne.

Parades will also be arranged for on the Saturday and Monday prior to the opening of the Royal Agricultural Show, Melbourne.

LIST OF CERTIFICATED STALLIONS.

(TO 31ST MARCH, 1908.)

Name of Horse.	Age.	Owner.	Parade.	Date.	Officer.
		DRAUGHTS.			
Ailsa Craig	3 years	H. M. S. Cox	Daylesford	20.9.07	W.J.C.
Akbar	5 years	W.F. Dorman	Pyramid Hill	3.8.07	S.S.C.
Ariel Prince	Aged	H. C. Robertson	Colac	7.8.07	S.S.C.
Arthur McBride	6 years	Craven Bros.	Tatura	24.8.07	W.R.
Atkenbraigh	Aged	Summerhill Stud Farm	Kyneton	26.9.07	W.R.
Atlas	3 years	A. Elwell	Maffra	16.8.07	W.J.C.
Avondale	6 years	Jas. Harper	Murchison Show	30.10.07	W.R.
Avondale	3 years	J. Walder	Birchip	21.8.07	W.J.C.
Bar None	3 years	D. Stewart	Ballarat Show	17.10.07	S.S.C.
Baron's Son	3 years	G. J. Butler	Maldon Show	30.10.07	S.S.C.
Barrow Admiral	Aged	P. J. Reid	Wangaratta	15.8.07	S.S.C
Belted Knight	Aged	C. J. Cecil	Sea Lake	15.8.07	N.M.
Ben Lomond	*5 years*	*J. McDonald*	*Kaniva*	*22.8.07*	*N.M.*
Ben More II.	3 years	Con. Hogan	Horsham Show	27.9.07	S.S.C.
Bernewang	Aged	W. McKnight	Swan Hill	7.8.07	W.R.
Black Heather	*3 years*	*R. A. Barrett*	Numurkah	9.10.07	W.J.C.
Black Knight	..	W. H. Michael	Ballarat Show	17.10.07	S.S.C.
Blue Chief	Aged	A. Purcell	Yarrawonga	16.8.07	S.S.C.
Blythe Laddie	4 years	Caffery and Murphy	Horsham	18.7.07	S.S.C.
Bonnie Champion	3 years	P. R. Hearne	Mansfield Show	21.11.07	N.M.
Bonnie Lad	Aged	J. G. Schneider	*Hamilton*	*17.8.07*	W.R.
Bonnie Star	3 years	J. Carroll	Benalla	17.8.07	S.S.C
Bonnie Style	4 years	D. Fox	Hamilton	17.8.07	W.R.
Bonny Bray	Aged	D. Coghill	Numurkah Show	9.10.07	W.J.C.
Boy Style	3 years	W. Anderson	Geelong	31.8.07	S.S.C.
British Lion	Aged	Habel Bros.	Hamilton	17.8.07	W.R.
British Oak	Aged	A. Kinghorn	Warracknabeal	14.8.07	W.R.
British Officer	Aged	J. Mason	St. Arnaud	28.8.07	W.J.C.
British Wrestler	Aged	J. Ryan	Yarrawonga	16.8.07	S.S.C.
Buckshot	Aged	A. Henderson	Warrnambool	10.9.07	W.J.C.
Cameron's Chief	Aged	— MacNab	Maffra	16.8.07	W.J.C.
Captain Cook	Aged	W. Bolger	Traralgon	31.7.07	S.S.C.
Captain Gun	3 years	— Fisher	Morwell	16.9.07	W.J.C.
Captain Seddon	4 years	H. Boyd	Elmore	26.8.07	W.J.C.
Carlisle	*4 years*	*J. C. Younger*	*Benalla*	*17.8.07*	S.S.C.
Carmyle	6 years	F. Day	Nhill	21.8.07	S.S.C.
Cedric	..	J. Wallace	Pyramid Hill Show	23.10.07	W.R.
Celt	4 years	Jno. Ervin, sen.	Pyramid Hill	3.8.07	S.S.C.
Champion of the North	3 years	J. Roberts	Kyneton	26.9.07	W.R.
Champion Scotsman	5 years	E. Gamble	Morwell	16.9.07	W.J.C.
Charmer	4 years	F. W. Saliman	Nhill	21.8.07	S.S.C.
Clansman II.	5 years	H. Curran	Traralgon	31.7.07	S.S.C.
Clifton	4 years	H. Ross	Mansfield	30.8.07	W.J.C.
Cluny's Style	Aged	Lewis Clark	Traralgon	31.7.07	S.S.C.
Clydesdale King	5 years	Jas. Phillips	Shepparton	24.8.07	S.S.C.
Commander	4 years	T. Creighton	Mansfield	30.8.07	W.J.C
Commonwealth	5 years	G. R. McPhail	Sale Show	31.10.07	W.J.C.
Cooring Chief	3 years	R. Black	Lilydale	23.8.07	W.J.C.
County Member	Aged	J. Moss	St. Arnaud	28.8.07	W.J.C.
Craigie Le Varden	5 years	F. Stiles	Geelong	31.8.07	S.S.C.
Craig Lea	4 years	N. McLean	Minyip	21.8.07	W.R.
Crown Prince	6 years	D. Trewick	Elmore	26.8.07	W.J.C.
Crown's Jewel	3 years	R. Ward	Nhill	21.8.07	S.S.C.
Dandy Dick	..	*M. Ewart*	*Royal Show*	*8.9.07*	*S.S.C.*
Darnley's Best	3 years	J. Cumming, jun.	Royal Show	7.9.07	S.S.C.
Diamond Prince	3 years	T. Hart	Wangaratta	15.8.07	S.S.C.
Dictate	6 years	J. Bunge	Warracknabeal	14.8.07	W.R.
Dingly Dell Standard Bearer	3 years	F. J. Cato	Agricultural Offices	10.9.07	S.S.C.
Donald's Pride	3 years	.. ..	Maryborough Show	16.10.07	S.S.C.
Duke of Albyn	Aged	L. G. Calvert	Colac	7.8.07	S.S.C.
Duke of Athol	*5 years*	*M. Brown*	*Sea Lake*	*15.8.07*	*N.M.*
Duke of York	*Aged*	*A. Wallace*	*Pyramid Hill*	3.8.07	S.S.C.
Earl Jock	4 years	D. McNamara	Elmore	26.8.07	W.J.C.
Experiment	Aged	Shields Bros.	Dookie	27.7.07	W.J.C.
Extinguisher II.	4 years	Dunning and Shea	Numurkah	9.10.07	W.J.C.
Everlasting	Aged	Jas. Clark	Yarrawonga	16.8.07	S.S.C.
Falstaff	..	J. Cockbill	Melton	10.8.07	S.S.C.
Farmer	6 years	G. Missen	Maffra	16.8.07	W.J.C.
Farmer	Aged	— Buckley	Morwell	16.9.07	W.J.C.

List of Certificated Stallions—*continued.*

Draughts—*continued.*

Name of Horse.	Age.	Owner.	Parade.	Date.	Officer.
Farmer's Glory	..	W. J. Stiles	Cobram	23.8.07	N.M.
Federal King	3 years	H. McLean	Shepparton	24.8.07	S.S.C.
Federal Prince	3 years	L. McLeod	Tatura	24.8.07	S.S.C.
Federal Style	3 years	T. T. Mulder	Colac	7.8.07	S.S.C.
Federation	Aged	F. Hamill	Maffra	16.8.07	W.J.C.
Flashwood	3 years	Dean Bros.	Euroa	14.8.07	S.S.C.
Flashwood	Aged	*Meyer Bros.*	*Kaniva*	28.8.07	N.M.
Forest Chief	3 years	D. W. Stewart	St. Arnaud	28.8.07	W.J.C.
Forester	6 years	H. C. Lees	Tallangatta Show	5.3.08	W.J.C.
Forest Hill	5 years	Balmattum Horse Breeders' Assn.	Euroa	14.8.07	S.S.C.
Fortune Teller	5 years	— Stephens	St. Arnaud	28.8.07	W.J.C.
Gallant Lad	4 years	J. Hamilton	Murtoa	9.8.07	W.J.C.
Gallant Lad	Aged	E. Land	Wangaratta	15.8.07	S.S.C.
General Grant	Aged	T. Creighton	Mansfield	30.8.07	W.J.C.
General McClelland	Aged	Healey and Harwood	Kyneton	26.9.07	W.R.
Gladbrook	6 years	Tippett Bros.	Maryborough Show	16.10.07	S.S.C.
Glancer	Aged	M. Bolger	Traralgon	31.7.07	S.S.C.
Glencoe	Aged	Jno. *Hewlett*	*Euroa*	14.8.07	S.S.C.
Glen Dhu	3 years	J. R. Stokes	Maryborough Show	16.10.07	S.S.C.
Glengarry	4 years	Caffery and Murphy	Horsham	18.7.07	S.S.C.
Glenoak	Aged	C. Wallis	Kaniva	28.8.07	N.M.
Golden Gift	3 years	Wm. Foubister	Kyneton	26.11.07	W.R.
Gordon Lad	Aged	W. J. Murray	Lilydale	23.8.07	W.J.C.
Governor General	Aged	Jas. Scott	Korumburra	29.9.06	S.S.C.
Haiswell	3 years	Dyke Bros.	St. Arnaud	28.8.07	W.J.C.
Hamilton Hero	3 years	H. McLure	Birchip	21.8.07	W.J.C.
Hawthorn's Pride	3 years	W. J. Taylor	Seymour	29.8.07	W.J.C.
Heather Jock	3 years	S. M. Brown	Cobram	23.8.07	N.M.
Herald Lad	3 years	L. Roach	Traralgon	31.7.07	S.S.C.
Herculas	4 years	P. Kneenan	Yarrawonga	16.8.07	S.S.C.
Herod's Knight	3 years	*E. J. Beer*	*Echuca*	24.8.07	W.J.C.
Highland Sandy	4 years	J. Crawford	Echuca	24.8.07	W.J.C.
His Majesty	4 years	Geo. Jackson	Dookie	27.7.07	W.J.C.
Honest Ben	3 years	C. Ley	Casterton	28.8.07	W.R.
Ian Lad	3 years	Jno. Thomas	Horsham	18.7.07	S.S.C.
Ian McDougall	5 years	B. Benton	Kyneton	26.9.07	W.R.
Imperial Prince	4 years	Batten Bros.	St. Arnaud	28.8.07	W.J.C.
Irish Hero	6 years	E. Spinks	Wycheproof	20.8.07	W.J.C.
Jack of Hearts	6 years	J. Giles	Horsham	18.7.07	S.S.C.
John Ballance	Aged	R. H. B. Guest	Horsham	18.7.07	S.S.C.
Jock	Aged	Wm. Williams	Cobram	23.8.07	N.M.
Keithdale	5 years	W. Mitchell	Geelong	31.8.07	S.S.C.
Kelvin Craig	Aged	Jno. McDougall	Dookie	29.7.07	W.J.C.
Kelvin Grove	..	— Foster	Maffra	16.8.07	W.J.C.
Kenwyn Jock	4 years	— Berry	St. Arnaud	28.8.07	W.J.C.
Kilmore	Aged	A. P. Jones	Birchip	21.8.07	W.J.C.
King Albyn	5 years	J. Ronsch	Echuca	28.8.07	W.J.C.
King Ben	Aged	W. Mill	Nhill	21.8.07	S.S.C.
King of the Valley	3 years	D. J. Murphy	Elmore Show	25.9.07	W.R.
Kinloch	4 years	W. Bodey	Nhill	21.8.07	S.S.C.
Laird o' Lanark	3 years	P. Rogers	Dimboola Show	11.10.07	S.S.C.
Lauderdale	Aged	Jas. Jenkins	Warrnambool	10.9.07	W.J.C.
Lawsuit	3 years	R. Crittenden	Jeparit Show	16.10.07	W.J.C.
Lion	4 years	H. J. Alford	Yarram	21.8.07	N.M.
Little Wonder	4 years	A. C. Petrass	Murtoa	9.8.07	W.J.C.
Lochiel's Champion	5 years	Ryan and Cooper	Euroa	14.8.07	S.S.C.
Locknaw Hero	Aged	D. Syme	Lilydale	23.8.07	W.J.C.
Lonsdale	3 years	Cooper Bros.	Stawell Show	18.9.07	W.R.
Lucky Willie	6 years	Otto Moroske	Horsham Show	24.9.07	S.S.C.
Lord Clifford	4 years	A. E. Scholtz	Tallangatta Show	5.3.08	W.J.C.
Lord Dean	5 years	W. D. Taylor	Lilydale Show	4.3.08	W.R.
Lord Dunbar	3 years	J. J. Downie	Ballarat Show	17.10.07	S.S.C.
Lord Dunkeld	3 years	Mrs. Sutherland	Ballarat Show	17.10.07	S.S.C.
Lord Dunmore	3 years	D. McKinnon	Wycheproof Show	4.10.07	W.R.
Lord Hopetoun	Aged	J. E. Morgan	Pyramid Hill	3.8.07	S.S.C.
Lord Hopton	Aged	G. A. Neville	Sea Lake	15.8.07	N.M.
Lord McDonald	*4 years*	J. *Meehan*	*Bunyip Show*	26.2.08	W.R.
Lord Percy	3 years	W. Mills	Nhill	21.8.07	S.S.C.
Lord Roberts	5 years	Thos. Fulham	Echuca	24.8.07	W.J.C.
Lord Ronald	5 years	A. W. Warren	Geelong	31.8.07	S.S.C.
Lord Stanley	Aged	W. Harty, sen.	Wycheproof	20.8.07	W.J.C.
Lord Wallace	3 years	E. J. Rickey	Maryborough Show	16.10.07	S.S.C.
Mafeking	3 years	P. Gottschutzke	Sea Lake	15.8.07	N.M.
Magnet	Aged	W. A. Mitchell	Hopetoun	3.8.07	W.J.C.

LIST OF CERTIFICATED STALLIONS—*continued.*

DRAUGHTS—*continued.*

Name of Horse.	Age.	Owner.	Parade.	Date.	Officer.
Major General ..	4 years	D. Kennealy ..	Benalla	17.8.07	S.S.C.
Major MacDonald ..	5 years	G. and W. Lord ..	Rosedale	13.11.07	W.R.
Major Robin ..	Aged	J. C. Rockcliffe ..	Numurkah Show ..	9.10.07	W.J.C.
Marcellus	4 years	W. Cavanagh ..	Euroa	14.8.07	S.S.C.
Marquis of Boorol ..	3 years	McPherson Bros. ..	Yarrawonga ..	16.8.07	S.S.C.
Matchless Oak ..	Aged	*Sambell Bros.* ..	*Nhill*	21.8.07	S.S.C.
Model	3 years	W. G. Down ..	Dookie	27.7.07	W.J.C.
Model	Aged	P. J. Grogan ..	Birchip	21.8.07	W.J.C.
Model	6 years	A. J. Bodey ..	Camperdown ..	26.9.07	W.J.C.
Montrave	3 years	J. Wheelan ..	Korumburra Show ..	22.1.08	W.R.
Macarthur Again ..	Aged	A. Kennedy ..	Shepparton	24.8.07	S.S.C.
MacDonald ..	3 years	G. Porteous ..	Maryborough Show ..	16.10.07	S.S.C.
Native Blue ..	Aged	S. Doak	Mansfield	30.8.07	W.J.C.
Native Prince ..	Aged	J. Clements ..	Warrnambool ..	10.9.07	W.J.C.
Near the Mark ..	5 years	W. Hicks	Kilmore	27.8.07	S.S.C.
Neil Gow	3 years	J. Hamilton ..	Horsham Show ..	27.9.07	S.S.C.
O'Connell's Pride ..	*3 years*	*J. P. Billesville* ..	*Birchip*	21.8.07	W.J.C.
Orbost	6 years	F. G. Allen and Son	Nhill	21.8.07	S.S.C.
Pearlstone	4 years	Fred. Walsh ..	Melton	10.8.07	S.S.C.
Pedestal	5 years	T. Davies ..	Ballarat Show ..	17.10.07	S.S.C.
Premier Prince ..	4 years	J. D. Rathgin ..	Traralgon	31.7.07	S.S.C.
President	4 years	J. McLeod ..	Echuca	24.8.07	W.J.C.
Pride of the Hills ..	4 years	*J. Taylor*	*Lilydale*	23.8.07	W.J.C.
Pride of the Hills ..	Aged	R. McDonald ..	Geelong	31.8.07	S.S.C.
Pride of the Park ..	4 years	Trustees, Barwon Park	Geelong	31.8.07	S.S.C.
Pride of the Walk ..	..	T. Pollock	Maffra	16.8.07	W.J.C.
Prince Again ..	3 years	D. J. Ferguson ..	Seymour Show ..	11.10.07	W.J.C.
Prince Arthur ..	Aged	F. Quire	Kaniva	28.8.07	N.M.
Prince Champion ..	4 years	McManus Bros. ..	Kilmore	27.8.07	S.S.C.
Prince Charlie ..	Aged	J. Taylor	Camperdown ..	26.9.07	W.J.C.
Prince Clyde ..	Aged	W. E. Taylor ..	Cobram	23.8.07	N.M.
Prince Imperial ..	3 years	D. Murphy ..	Echuca	24.8.07	S.S.C.
Prince of Albyn ..	*Aged*	*J. Wilson*	*Tatura*	24.8.07	W.R.
Prince of Avondale ..	Aged	— McGregor ..	Elmore	26.8.07	W.J.C.
Prince of Hearts ..	6 years	Jos. Phalp ..	Colac Show ..	7.8.07	S.S.C.
Prince of Kyle ..	Aged	Jno. Bushby ..	Horsham	18.7.07	S.S.C.
Prince of Lorne ..	5 years	R. Young ..	Shepparton	24.8.07	S.S.C.
Prince of Oaklands	4 years	M. J. Ryan ..	Wycheproof ..	20.8.07	W.J.C.
Prince of the Clans ..	6 years	J. Annison ..	Warracknabeal ..	14.8.07	W.R.
Prince York ..	3 years	W. G. Freeman ..	Echuca	24.8.07	W.J.C.
Rainbow	..	G. Ritchie ..	Warrnambool ..	10.9.07	W.J.C.
Ribbonwood ..	5 years	White Bros. ..	Lilydale	23.8.07	W.J.C.
Right Bower ..	Aged	D. Blair	Wycheproof Show ..	4.10.07	W.R.
Robin	4 years	C. Simons ..	Leongatha Show ..	11.2.08	S.S.C.
Robin Adair ..	4 years	A. Robinson ..	Murchison Show ..	30.10.07	W.R.
Robert Charters ..	3 years	W. T. Bodey ..	Horsham Show ..	24.9.07	S.S.C.
Roseberry	Aged	Smith Bros. ..	Mansfield	30.8.07	W.J.C.
Royal Ben	6 years	— Le Laver ..	Swan Hill	7.8.07	W.R.
Royal Blue	3 years	H. Rathjen ..	Elmore	26.8.07	W.J.C.
Royal Cedric ..	6 years	*Jno. Goodwin* ..	Warrnambool ..	10.9.07	W.J.C.
Royal Charlie ..	Aged	Thos. Potts ..	Kyneton Show ..	26.11.07	W.R.
Royal Chief ..	3 years	T. Lowes	Wycheproof Show ..	4.10.07	W.R.
Royalist III. ..	Aged	Thos. Moore ..	Shepparton	24.8.07	S.S.C.
Royal Kingston ..	5 years	C. Northby ..	St. Arnaud ..	28.8.07	W.J.C.
Royal Prince ..	3 years	E. Wilson ..	Korumburra ..	29.9.06	S.S.C.
Royal Ribbon ..	Aged	H. Boyd	Elmore	26.8.07	W.J.C.
Sampson	3 years	G. and W. Lord ..	Sale Show	31.10.07	W.J.C.
Sandow	Aged	G. Lyon	Coleraine Show ..	6.11.07	W.J.C.
Scotch Thistle ..	3 years	Peter McIntyre ..	Geelong	31.8.07	S.S.C.
Scotland Again ..	Aged	F. Hamill ..	Maffra	16.8.07	W.J.C.
Scotland's Fashion ..	*5 years*	*Jno. James* ..	*Colac Show* ..	24.10.07	S.S.C.
Scotland Yet ..	3 years	J. Meehan ..	Bunyip Show ..	26.3.08	W.R.
Sheppard's Pride ..	3 years	A. Robinson ..	Murchison Show ..	30.10.07	W.R.
Silver Crest ..	3 years	P. Watson ..	Korumburra Show ..	22.1.08	W.R.
Sir Albyn	4 Aged	R. Pinnock ..	Lilydale	23.8.07	W.J.C.
Sir Albyn	Aged	J. R. Johnston ..	Colac	7.8.07	S.S.C.
Sir Benjamin ..	Aged	J. Milsteed ..	Sea Lake	15.8.07	N.M.
Sir Colin	4 years	Koch Bros. ..	Casterton	28.8.07	W.R.
Sir Colin	3 years	T. Gifford ..	St. Arnaud ..	28.8.07	W.J.C.
Sir David ..	6 years	Dowington Bros. ..	Nhill	21.8.07	S.S.C.
Sir Donald ..	4 years	T. H. Roe ..	Shepparton	24.8.07	S.S.C.
Sir Harold ..	Aged	H. Bainbridge ..	Agricultural Offices ..	6.3.08	W.J.C.
Sir Herod II. ..	3 years	A. Watson ..	Kyneton	26.9.07	W.R.
Sir James	Aged	W. O'Callaghan ..	Minyip	21.8.07	W.R.

LIST OF CERTIFICATED STALLIONS—*continued.*

Name of Horse.	Age.	Owner.	Parade.	Date.	Officer.
		DRAUGHTS—*continued.*			
Sir Malcolm ..	6 years	W. R. Pittman ..	Nhill	21.8.07	S.S.C.
Sir Percy	4 years	T. McCrackens ..	Hamilton	17.8.07	W.R.
Sir Randler ..	3 years	R. W. Bowen ..	Kyneton	26.9.07	W.R.
Sir William ..	6 years	Robt. Glen ..	Sale Show	31.10.07	W.J.C.
Sir William.. ..	3 years	Caffery and Murphy	Horsham Show ..	18.7.07	S.S.C.
Sir William ..	4 years	— Langford ..	Pyramid Hill Show ..	23.10.07	W.R.
Sir William ..	4 years	G. Payne	Alexandra ..	14.9.07	W.J.C.
Smuggler	6 years	S. Winter Cooke ..	Hamilton	17.8.07	W.R.
Stanley	6 years	F. Hamill	Maffra	16.8.07	W.J.C.
St. Lawrence ..	Aged	F. Pilgrim and Son	Nhill	21.8.07	S.S.C.
Strawn Brace ..	Aged	W. H. Lavery ..	Birchip	21.8.07	W.J.C.
Stylish Style ..	*3 years*	.. .. ..	*Pyramid Hill Show* ..	*23.10.07*	*W.R.*
Tarquin	..	S. Wrathall ..	Geelong	31.8.07	S.S.C.
The Colonel ..	4 years	G. and W. Lord ..	Traralgon Show ..	13.11.07	W.R.
The Duke ..	5 years	B. McKenzie ..	Grantville and Jeetho Show	16.1.08	W.R.
The General ..	3 years	Spalding and Sons..	Geelong	31.8.07	S.S.C.
The King	3 years	J. Biggar	Numurkah Show ..	9.10.07	W.J.C.
The Maori Prince ..	Aged	Jas. Carson ..	Camperdown ..	26.9.07	W.J.C.
The McGregor ..	Aged	Dunning and Shea	Cobram	33.8.07	N.M.
The Real Scottie ..	4 years	J. Biggar	Korumburra ..	18.9.07	W.J.C.
The Sirdar ..	..	E.A. House ..	Daylesford	20.9.07	W.J.C.
Togo	5 years	Jno. Dufty and Son	Nhill	21.8.07	S.S.C.
Togo	6 years	J. Cresp	Birchip	21.8.07	W.J.C.
Togo	3 years	W. Curtis ..	Wangaratta ..	15.8.07	S.S.C.
Tommy Burns ..	3 years	E. Sleep	Horsham Show ..	24.9.07	S.S.C.
Tom's Pride ..	4 years	H. Green	Birchip	21.8.07	W.J.C.
Tulcan Warrior ..	4 years	Stephen Wrathall ..	Hopetoun	3.8.07	W.J.C.
Tweedside Chief ..	5 years	Thos. Duffy ..	Colac	7.8.07	S.S.C.
Tweedside Hero ..	Aged	H. W. Adams ..	Warrnambool ..	10.9.07	W.J.C.
United Prince ..	6 years	P. Fitzpatrick ..	Kilmore	27.8.07	S.S.C.
Waiponumu ..	3 years	E. Hooper	Geelong	31.8.07	S.S.C.
Waitaki Chief ..	5 years	W. Mosedale ..	Melton	10.8.07	S.S.C.
Werribee Prince ..	4 years	— McKoy ..	Tallangatta Show ..	3.3.08	W.J.C.
Western Hero ..	..	Davis and Woolsthorpe	Warrnambool ..	10.9.07	W.J.C.
Wolseley	4 years	J. A. Rankin ..	Kaniva	28.8.07	N.M.
Worrack	6 years	McLeod Bros. ..	Yarram	21.8.07	N.M.
Young Albyn ..	5 years	Jno. Rousch ..	Echuca	24.8.07	W.J.C.
Young Champion ..	Aged	R. Blomeley ..	Cobram	23.8.07	N.M.
Young Clansman II.	6 years	A. Kelly	Camperdown ..	26.9.07	W.J.C.
Young Clifton ..	Aged	T. McKimmie ..	Seymour	29.8.07	W.J.C.
Young Heart of Oak	Aged	F. Rodda	Jeparit Show ..	16.10.07	W.J.C.
Young King Louis ..	*6 years*	*W. Ross*	*Swan Hill* ..	*7.8.07*	*W.R.*
Young Loch Gyle ..	4 years	J. Henderson ..	Leongatha	11.2.08	S.S.C.
Young Lord Byron ..	3 years	A. McCallum ..	Jeparit Show ..	16.10.07	W.J.C.
Young Mariner ..	5 years	Otto Knee ..	Minyip	21.8.07	W.R.
Young Model ..	3 years	M. McCallum ..	Geelong	31.8.07	S.S.C.
Young McGregor ..	3 years	E. Don	Kyneton Show ..	26.11.07	W.R.
Young Native Oak ..	4 years	— Irwin	Nhill	21.8.07	S.S.C.
Young Officer ..	3 years	Jno. Grey ..	St. Arnaud ..	28.8.07	W.J.C.
Young Prince ..	Aged	Geo. Dennis ..	Maldon Show ..	30.10.07	S.S.C.
Young Royal Oak ..	Aged	W. Pohlner ..	Nhill	21.8.07	S.S.C.
Young Sir William ..	4 years	— Cain	Mirboo	25.10.06	S.S.C.
Young Sovereign ..	3 years	Webster Bros. ..	Benalla	17.8.07	S.S.C.
Young Stanley ..	6 years	R. Fleming ..	Wycheproof Show ..	4.10.07	W.R.
Young Straun ..	Aged	.. .. ..	Nhill	21.8.07	S.S.C.
Young Style ..	Aged	A. Oliver	Casterton	28.8.07	W.R.
		THOROUGHBREDS.			
Alarm	Aged	Connelly Bros. ..	Birchip	21.8.07	W.J.C.
Ben Johnson ..	6 years	Percy Rowan ..	Leongatha	11.2.08	S.S.C.
Beware	Aged	J. Jenkins ..	Warrnambool ..	10.9.07	W.J.C.
Bloodshot	Aged	T. Hart	Wangaratta ..	15.8.07	S.S.C.
Carlisle	3 years	E. A. House ..	Maryborough Show ..	16.10.07	S.S.C.
Chesterman ..	Aged	T. O'Keefe ..	Shepparton.. ..	24.8.07	S.S.C.
Colleague	4 years	H. Coller	Alexandra	14.9.07	W.J.C.
Defoe	Aged	J. Brooks ..	Kyneton	26.9.07	W.R.
Dirk Hammerhand ..	5 years	J. M. Campbell ..	Echuca	24.8.07	W.J.C.
Dirk Hammerhead ..	4 years	— Bowtell ..	Echuca	24.8.07	W.J.C.
Donald Mac ..	Aged	A. Stewart ..	Mansfield	30.8.07	W.J.C.
Eclipse	5 years	Jas. Tranter ..	Kyneton Show ..	26.11.07	W.R.
Eclipse	Aged	A. Kennedy ..	Euroa	14.8.07	S.S.C.
Emerald	5 years	J. Danaher ..	Kyneton	26.9.07	W.R.

List of Certificated Stallions—*continued.*

Name of Horse.	Age.	Owner.	Parade.	Date.	Officer.
		Thoroughbreds—*continued.*			
Eumarrah	Aged	C. Nunn	Pyramid Hill Show	23.10.07	W.R.
Euphorian	Aged	P. Travers	Wangaratta	15.8.07	S.S.C.
Falkirk	Aged	D. Jackman	Warrnambool	10.9.07	W.J.C.
Fontenoy	Aged	J. Hoolihan	Dookie	27.7.07	W.J.C.
Freelance	4 years	R. Gilder	Maffra Show	24.10.07	W.J.C.
Gambler II.	Aged	— Anderson	Shepparton	24.8.07	S.S.C.
Grenadier	Aged	D. Ryan	Seymour	29.8.07	W.J.C.
Gnarpurt	Aged	H. T. Hoysted	Wangaratta	15.8.07	S.S.C.
Hassan	Aged	E. A. Watson	Minyip	21.8.07	W.R.
Heather Lad	Aged	C. R. Davis	Maffra	24.10.07	W.J.C.
Hobson	Aged	C. Edwards	Swan Hill	7.8.07	W.R.
Iroquois	Aged	G. Pearson	Benalla	17.8.07	S.S.C.
Juniper	Aged	..	Horsham Show	24.9.07	S.S.C.
Millstone	Aged	J. O'Donoghue	Elmore	26.8.07	W.J.C.
Norback	5 years	F. Quire	Kaniva	27.8.07	N.M.
Pianola	Aged	F. Larkin	Wangaratta	15.8.07	S.S.C.
Pilgrim's Rest	Aged	A. E. Scholtz	Tallangatta Show	5.3.08	W.J.C.
Presto	Aged	G. Washington	Euroa	14.8.07	S.S.C.
Preston	Aged	C. Pratt	Seymour Show	11.10.07	W.J.C.
Prime	Aged	L. Cusack	Euroa	14.8.07	S.S.C.
Rufus	Aged	Smith Bros.	Mansfield	30.8.07	W.J.C.
Sailor King	Aged	H. Gibbins	Pyramid Hill Show	23.10.07	W.R.
Selkirk	3 years	A. Scott	Elmore	26.8.07	W.J.C.
Stamp	Aged	Kettle and Moroney	Wangaratta	15.8.07	S.S.C.
Straightfire	Aged	A. E. Saunders	Alexandra	14.9.07	W.J.C.
Straightshot	Aged	*Jno. McDonald*	*Horsham Show*	24.9.07	S.S.C.
St. Swivan	6 years	M. Gargan	Mirboo North	24.9.07	N.M.
The Chevalier	Aged	*R. Gilder*	*Maffra Show*	24.10.07	W.J.C.
The Harvester	Aged	S. Winter Cooke	Hamilton	17.8.07	W.R.
Trentbridge	Aged	J. Devlin	Horsham	18.7.07	S.S.C.
True Sign	Aged	G. H. Hill	Colac	7.8.07	S.S.C.
Vengeance	Aged	*R. Ward*	*Nhill*	21.8.07	S.S.C.
Westerley	Aged	Jno. McKinnon	Korumburra	18.9.07	W.J.C.
Whalebone	Aged	W. R. Cross	Hamilton	17.8.07	W.R.
Winchester	..	C. Airey	Rupanyup Show	20.9.07	W.R.
Wotan	4 years	T. Dickenson	Ballarat Show	17.10.07	S.S.C.
Yettendon	Aged	A. Bond	Casterton	28.8.07	W.R.
Young Cureton	3 years	*Major McLeod*	*Lilydale*	23.8.07	W.J.C.
Young Pieman	5 years	M. McLean	Mansfield	30.8.07	W.J.C.
Young Richmond	Aged	W. Sutton	Lilydale	23.8.07	W.J.C.
Young Vengeance	3 years	E. Huff	Nhill	21.8.07	S.S.C.
		LIGHT HORSES.			
Alarm Gun	6 years	Jno. Boulger	Morwell	16.9.07	W.J.C.
Alva	Aged	D. Coutts	Hamilton Show	19.9.07	N.M.
Ashplant II.	Aged	A. Kennedy	Euroa	14.8.07	S.S.C.
Attendant	6 years	T. Hanrahan	Cobram	23.8.07	N.M.
Baron Moor	3 years	D. Ryan	Seymour	29.8.07	W.J.C.
Bay Hawk	Aged	*E. Hooper*	*Geelong*	31.8.07	S.S.C.
Black Hawk	3 years	G. S. Farrar	Colac Show	24.10.07	S.S.C.
Blackness	Aged	R. Penny	Jeparit Show	16.10.07	W.J.C.
Black Prince	4 years	T. Mackie	Morwell	16.9.07	W.J.C.
Blackstone	Aged	R. Storey	Shepparton	24.8.07	S.S.C.
Brightlight	Aged	R. Penny	Jeparit Show	16.10.07	W.J.C.
Brooklyn Junr.	3 years	E. W. Roscoe	Benalla	17.8.07	S.S.C.
Brooklyn Peer	3 years	W. Mahoney	Shepparton	24.8.07	S.S.C.
Cabena	3 years	M. Kinnane	Wycheproof Show	4.10.07	W.R.
Calliope	Aged	S. Gardiner	Benalla	17.8.07	S.S.C.
Commodore	Aged	G. Kemp	Geelong	31.8.07	S.S.C.
Coolgardie	Aged	Alex. Gunn	Donald	14.8.07	W.J.C.
Cosmopolitan Junr.	6 years	A. Wade	Ballarat Show	17.10.07	S.S.C.
Dragon	Aged	D. Munroe	Casterton	28.8.07	W.R.
Dynamo	5 years	A. Stoner	Yarram	21.8.07	N.M.
Earl Hampden	3 years	J. E. Kneebone	Wangaratta	15.8.07	S.S.C.
Euroa	Aged	J. R. Arbuthnott	Mansfield	30.8.07	W.J.C.
Fearless	3 years	T. D. Dickenson	Ballarat Show	17.10.07	S.S.C.
Fintonia	Aged	J. White	Minyip Show	1.10.07	N.M.
Fireaway	Aged	—. Harbeck	Jeparit Show	16.10.07	W.J.C.
Frank Osterley	4 years	G. Ward	Benalla	21.8.07	S.S.C.
Goldie	3 years	H. J. Scott	Shepparton	24.8.07	S.S.C.
Gold Top	Aged	..	Seymour Show	11.10.07	W.J.C.
Grand Emerald	6 years	J. McKenna	Wycheproof Show	4.10.07	W.R.
Grey Royal	Aged	A. Boyd	Minyip	21.8.07	W.R.
Guide (roadster)	Aged	C. McLean	Mansfield	30.8.07	W.J.C.
Hainault	Aged	G. Collis	Yarram	21.8.07	N.M.

LIST OF CERTIFICATED STALLIONS—*continued.*

LIGHT HORSES—*continued.*

Name of Horse.	Age.	Owner.	Parade.	Date.	Officer.
Hold-on	5 years	E. Hanson	Kilmore	27.8.07	S.S.C.
Hornsboro'	3 years	J. McGuinness	Wangaratta	15.8.07	S.S.C.
Imperial	Aged	H. W. Adams	Warrnambool	10.9.07	W.J.C.
Ito	Aged	J. Graham	Wangaratta	15.8.07	S.S.C.
Joker	Aged	.. ..	Dookie	27.7.07	W.J.C.
Jupiter Junr.	*Aged*	*Rossiter Bros.*	*Yarram*	*21.8.07*	*N.M.*
Killarney II.	Aged	Baxter Bros.	Ballarat Show	17.10.07	S.S.C.
King Draper	..	Victor Edgar	Camperdown	26.9.07	W.J.C.
Larrakin	Aged	Mrs. Sutherland	Ballarat Show	17.10.07	S.S.C.
Lernecker	Aged	C. Lippiatt	Ballarat Show	17.10.07	S.S.C.
Lord Derby	Aged	Ken. McDonald	Alexandra	14.9.07	W.J.C.
Loudoun Squire	5 years	J. Dunlop	Colac	7.8.07	S.S.C.
Marland Derby	Aged	Stewart and Sloan	Wangaratta	15.8.07	S.S.C.
Merriang	Aged	D. Sanderson	Nhill	21.8.07	S.S.C.
Message	6 years	W. H. Michael	Leongatha Show	11.2.08	S.S.C.
Miss Prize	6 years	J. T. McGrath	Jeparit Show	16.10.07	W.J.C.
Macquarie	Aged	T. Aldons	Alexandra	14.9.07	W.J.C.
Oscar	4 years	Wm. Anderson	Colac Show	24.10.07	S.S.C.
Osterley Hero	5 years	E. Koenig	Horsham	18.7.07	S.S.C.
Pascarell	Aged	W. Roberts	Elmore	26.8.07	W.J.C.
Planet Boy	Aged	C. Butcher	Sea Lake	15.8.07	N.M.
Premier	5 years	Jos. Binns	Kaniva	28.8.07	N.M.
Protest	3 years	E. H. Bell	Traralgon Show	13.11.07	W.R.
Rosemusk	4 years	J. Bland	Yarram	21.8.07	N.M.
Safeguard	Aged	Evan Bros.	Wangaratta	15.8.07	S.S.C.
Seaforth Highlander	6 years	T. McCrae	Swan Hill	7.8.07	W.R.
Seldom Seen	6 years	S. Winter Cooke	Hamilton	17.8.07	W.R.
Shanet-a-boo	6 years	J. J. Sherry	Yarram	21.8.07	N.M.
Solicitor	*3 years*	*J. F. Oram*	*Minyip*	*21.8.07*	W.R.
Steel Arab	6 years	N. McLean	Minyip	21.8.07	W.R.
St. Patrick	..	A. Shebler, jun.	Melton	10.8.07	S.S.C.
Strathlodden	Aged	T. Wickens	Swan Hill	7.8.07	W.R.
Sunfish	4 years	W. Kennedy	Nhill	21.8.07	S.S.C.
Sunlight	Aged	H. C. Bowker	Colac	7.8.07	S.S.C.
Talk of the Hills	Aged	S. R. Klinge	Dimboola Show	11.10.07	S.S.C.
Terrific	Aged	H. C. Boyd	Maryborough Show	16.10.07	S.S.C.
Thunder Jewel	3 years	R. Hetherington	Minyip Show	1.10.07	N.M.
Triumph	4 years	T. Nelson	Cobram	23.8.07	N.M.
Vengeance II.	4 years	G. Hansler	Warracknabeal	14.8.07	W.R.
Volant	4 years	Jas. Clark	Yarrawonga	16.8.07	S.S.C.
Willie Wilks	3 years	M. Rowan	Yarrawonga	16.8.07	S.S.C.
Yamba	6 years	—. Smith, jun.	St. Arnaud	28.8.07	W.J.C.
Young Bow Boy	3 years	.. ..	Maldon Show	30.10.07	S.S.C.
Young Hamlet	Aged	Jno. Head	Kaniva	28.8.07	N.M.
Young Tynon	Aged	W. Rugge	Sea Lake	15.8.07	N.M.
Zouroff	Aged	J. Minns	Melton	10.8.07	S.S.C.

TROTTERS.

Name of Horse.	Age.	Owner.	Parade.	Date.	Officer.
Almo C.	3 years	Jack Clark	Shepparton	24.8.07	S.S.C.
Almont	Aged	A. and J. B. Sharp	Agricultural Offices	31.10.07	W.R.
Almont Ambassador	5 years	*J. Cameron*	*Maryborough Show*	*16.10.07*	S.S.C.
Almont B.	6 years	F. W. Schickerling	Warracknabeal	14.8.07	W.R.
Aster	Aged	R. F. Kurtle	Korumburra	29.9.06	S.S.C.
Austerlitz	Aged	W. Uebergang	Murtoa	9.8.07	W.J.C.
Avon Peer	Aged	—. Boyle	St. Arnaud	28.8.07	W.J.C.
Barrister	Aged	Bell Bros.	Murtoa Show	27.9.07	S.S.C.
Bell Boy	6 years	Griffin Bros.	Shepparton	24.8.07	S.S.C.
Best of Quality	Aged	G. Smith	Warrnambool	10.9.07	W.J.C.
Black Boy	Aged	Jas. Jenkins	Warrnambool	10.9.07	W.J.C.
Black Wilks	Aged	W. J. Wilson	Korumburra Show	22.1.08	W.R.
Bold Harold	Aged	W. Purcher	Sea Lake	15.8.07	N.M.
Bonnie Lea	Aged	S. Taylor	Swan Hill	7.8.07	W.R.
Bronte	Aged	C. Hands	Pyramid Hill Show	23.10.07	W.R.
Brown Harold	6 years	C. McLean	Mansfield	30.8.07	W.J.C.
Cheviot	6 years	M. Zimmer	Agricultural Offices	11.9.07	W.J.C
Colt by Granger Junr.	3 years	W. F. Allen	Horsham	18.7.07	S.S.C.
Contractor	4 years	J. Ovens	Murchison Show	30.10.07	W.R.
Crown Derby	3 years	Woolcock Bros.	Ballarat Show	17.10.07	S.S.C.
Dan Cleve	5 years	—. McCubbin	Donald	14.8.07	W.J.C.
Dan Tracey	5 years	J. G. Christie	Lilydale	23.8.07	W.J.C.
Demonstrator	4 years	Jas. Gooden	Warrnambool	10.9.07	W.J.C.
Dexter	Aged	T. Wilkins	Swan Hill	8.7.07	W.R.
Digitalis II.	5 years	S. Winterbottom	Pyramid Hill Show	23.20.07	W.R.
Diogenes	Aged	W. E. Trollope	Donald	14.8.07	W.J.C.
Dixie Alto	Aged	W. B. Viers	Kyneton Show	26.11.07	W.R.

LIST OF CERTIFICATED STALLIONS—*continued.*

Name of Horse.	Age.	Owner.	Parade.	Date.	Officer.
		TROTTERS—*continued.*			
Druce	3 years	*D. Canny*	*Traralgon*	31.7.07	S.S.C.
Emulous	5 years	M. Cann	Euroa	14.8.07	S.S.C.
Experience	..	Glenister Bros.	Hamilton Show	19.9.07	N.M.
F.D.B.	3 years	M. Vaughan	Hamilton	17.8.07	W.R.
FitzJames	5 years	Dyke Bros.	St. Arnaud	28.8.07	W.J.C.
Frank Harold	6 years	D. McLeod	Echuca	24.8.07	W.J.C.
Galty Boy	4 years	A. R. Lawrence	Kyneton	26.9.07	W.R.
General Standish	Aged	J. Davies	Ballarat Show	17.10.07	S.S.C.
Governor	3 years	—. McCubbery	Donald	14.8.07	W.J.C
Governor Tracey	Aged	E. G. Gorman	Yarrawonga	16.8.07	S.S.C.
Graingeburn	3 years	A. Ballenger	Horsham Show	24.9.07	S.S.C.
Granger II.	5 years	W. F. Allen	Horsham	18.7.07	S.S.C.
Granger Junr. II.	Aged	.. ..	Ballarat Show	17.10.07	S.S.C.
Grey Hawk	Aged	W. W. Pierce	Colac	7.8.07	S.S.C.
G.T.F.	6 years	Glenister Bros.	Coleraine Show	6.11.07	W.J.C.
Haco	Aged	Curragh Bros.	Echuca	24.8.07	W.J.C.
Hambletonian Bell Boy	Aged	Gregg and Crowe	Agricultural Offices	16.11.07	S.S.C.
Hambletonian Boy	*6 years*	*Peter Thompson*	*Wycheproof*	*20.8.07*	*W.J.C.*
Harold H.	5 years	R. C. Hannah	Donald	14.8.07	W.J.C.
Honest Bert	Aged	T. Harrison	Shepparton	24.8.07	S.S.C.
Honest Lad	4 years	F. P. Boyle	Euroa	14.8.07	S.S.C.
Hope Vale	Aged	Jas. Fisher	Warracknabeal Show	3.10.07	N.M.
Huon Seaton	6 years	Phillips and Devereaux	Warracknabeal Show	15.8.07	W.R.
Integrity	Aged	J. B. Docker	Wangaratta	15.8.07	S.S.C.
Integrity	Aged	J. J. Eady	Geelong	31.8.07	S.S.C.
Jonathan	Aged	W. Hiscock	Pyramid Hill	3.8.07	S.S.C.
J. R. Wilkes	Aged	Toms Bros.	Yarrawonga	16.8.07	S.S.C.
Kentucky	*6 years*	H. C. Johnson	Elmore	26.8.07	W.J.C.
King Harold	Aged	Francis Bros.	Morwell	16.9.07	W.J.C.
King Harold	5 years	T. McCubbery	Donald	14.8.07	W.J.C.
Kintyre	6 years	—. McGregor	Elmore	26.8.07	W.J.C.
La Marnie	4 years	Gilbert Bros.	Ballarat Show	17.10.07	S.S.C.
Maori Chief	3 years	L. Strickland	Colac Show	24.10.07	S.S.C.
Mazzeppa	*Aged*	*A. W. Harvey*	*Kyneton*	*26.9.07*	*W.R.*
Metal B.	6 years	E. Glasheen	Wycheproof	20.8.07	W.J.C.
More Huon	3 years	T. Moore	Shepparton	24.8.07	S.S.C.
Nick o' the Woods	Aged	W. P. Marwick	Daylesford	20.9.07	W.J.C.
Olympic	3 years	Thompson Bros.	Warracknabeal	14.8.07	W.R.
Olympic Yet	3 years	—. Bryce	St. Arnaud	30.8.07	W.J.C.
Osprey II.	5 years	Gilbert Bros.	Ballarat Show	17.10.07	S.S.C.
Ostenesty	6 years	F. J. Dorman	Pyramid Hill Show	23.10.07	W.R.
Osterfield	6 years	—. Willatts	Maryborough Show	16.10.07	S.S.C.
Osterley II.	..	W. Hutchinson	Murchison Show	30.10.07	W.R.
Osterley Again	4 years	G. Smith	Warrnambool	10.9.07	W.J.C.
Osterley Junr.	*Aged*	*Glady's Bros.*	*Murtoa Show*	*24.9.07*	*S.S.C.*
Osterley Wilkes	Aged	J. B. Marshall	Nhill	21.8.07	S.S.C.
Osterlight	3 years	G. S Connor	Colac Show	24.10.07	S.S.C.
Ostermeyer	5 years	E. Batson	Colac Show	24.10.07	S.S.C.
Ostray	6 years	J. Fitzgerald	Geelong	31.8.07	S.S.C.
Oswestry	5 years	J. Hefferman	Kilmore	27.8.07	S.S.C.
Othello	*5 years*	*A. Shebler*	*Melton*	*10.8.07*	*S.S.C.*
Prince Osterley	5 years	D. Murphy	Elmore	26.8.07	W.J.C.
Prince Osterley	4 years	C. W. Watts, jnr.	Agricultural Offices	1.10.07	W.R.
Prince Whips	5 years	J. McLeod	Echuca	24.8.07	W.J.C.
Principal	Aged	Glenister Bros.	Horsham Show	24.9.07	S.S.C.
Red Light	Aged	Neylands Bros.	Birchip	21.8.07	W.J.C.
Robin's Pride	..	A. Armstrong	Kyneton	26.9.07	W.R.
Royal Whips	4 years	A. J. Walter	Elmore	26.8.07	W.J.C.
Satellite	Aged	J. Putty	Wangaratta	15.8.07	S.S.C.
Sir Simon	..	D. Campbell	St. Arnaud	28.8.07	W.J.C.
Sir Wyhee	3 years	W. Connor	Colac	7.8.07	S.S.C.
Tallis W.	*4 years*	*J. T. Smith*	*Stawell*	*18.9.07*	*W.R.*
Testator	4 years	Arthur Knight	Agricultural Offices	8.10.07	S.S.C.
The Brook	4 years	D. McLeod	Echuca	24.8.07	W.J.C.
The Deemster	Aged	G. E. Kipping	Mansfield	30.8.07	W.J.C.
The Governor	5 years	Jno. Gooden	Warrnambool	10.9.07	W.J.C.
The Merchant	4 years	Oliver Bodey	Stawell	18.9.07	W.R.
The Trick	Aged	James Fisher	Warracknabeal Show	3.10.07	N.M.
Tidegate	Aged	J. Hiskins	Maffra	16.8.07	W.J.C.
Tommy Huon	4 years	J. G. Hodgson	Numurkah Show	9.10.07	W.J.C.
Truro	4 years	R. McInroy	Casterton	28.8.07	W.R.
Venture	4 years	J. Cockbill	Melton	10.8.07	S.S.C.
Victor's Pride	3 years	P. Doyle	Minyip	21.8.07	W.R.
Von Osterley	6 years	F. R. Heard	Geelong	31.8.07	S.S.C.
Walnut	Aged	G. Burgess	Daylesford	20.9.07	W.J.C.

LIST OF CERTIFICATED STALLIONS—*continued.*

Name of Horse.	Age.	Owner.	Parade.	Date.	Officer.
		TROTTERS—*continued.*			
Welfare	Aged	F. Holmes ..	Wangaratta	15.8.07	S.S.C.
Why Not .. .	3 years	O. Dutton ..	Shepparton..	7.9.07	S.S.C.
Wildbird	..	H. Bineham ..	Hamilton Show .	19.9.07	N.M.
Woodstock ..	Aged	Dickens Bros. ..	Kyneton .. .	26.9.07	W.R.
Young Ashplant ..	Aged	J. E. Morgan ..	Pyramid Hill .	3.8.07	S.S.C.
Young Irrtum ..	..	—. Fithall ..	St. Arnaud ..	28.8.07	W.J.C.
Young Osterley ..	Aged	N. McDonald ..	St. Arnaud ..	28.8.07	W.J.C.
		PONIES.			
Admiration.. ..	5 years	T. T. Taylor ..	Ballarat Show .	17.10.07	S.S.C.
Ally Sloper Colt ..	3 years	T. Patullo.. ..	Bunyip Show ..	26.2.08	W.R.
Alma Jimmy ..	3 years	G. Willatts ..	Maryborough Show ..	16.10.07	S.S.C.
Bally	Aged	J. F. King ..	Colac Show .	24.10.07	S.S.C.
Bally Rogan ..	3 years	J. E. Jellett ..	Geelong	31.8.07	S.S.C.
Bally Roy	4 years	A. J. Spalding and Sons	Geelong	31.8.07	S.S.C.
Bay Briton.. ..	Aged	P. Wohrton ..	Elmore Show ..	25.9.07	W.R.
Bell Boy	*6 years*	*J. D. Pryse* ..	*Wycheproof*	*20.8.07*	*W.J.C.*
Bill	Aged	J. Grinham ..	Casterton .. .	28.8.07	W.R.
Black Boy	3 years	C. Roberts ..	Morwell	16.9.07	W.J.C.
Black Prince ..	Aged	Staley and Connell	Swan Hill	7.8.07	W.R.
Bobbie Burns ..	Aged	R. H. Wright ..	Dimboola Show ..	11.10.07	S.S.C.
Bower	Aged	M. Quigley ..	Warrnambool ..	10.9.07	W.J.C.
Brassey's Pride ..	5 years	A. E. Millar ..	Nhill	21.8.07	S.S.C.
Brigham	3 years	S. Blakeley ..	Horsham Show ..	27.9.07	S.S.C.
Brigham Young II. ..	Aged	A. E. McCure ..	Colac .. .	7.8.07	S.S.C.
Brigham Young II. ..	Aged	J. Hall	Warrnambool .	10.9.07	W.J.C.
Bruce	4 years	K. Stewart ..	Cobram	23.8.07	N.M.
Bryce	..	C. McKay ..	Stawell Show ..	18.9.07	W.R.
By Night	4 years	Hunt Bros. ..	Dookie	27.7.07	W.J.C.
Canary	Aged	G. Gould	Birchip	21.8.07	W.J.C.
Caractacus II. ..	Aged	Farrell Bros. ..	Warrnambool ..	10.9.07	W.J.C.
Cardiff	4 years	W. H. Spooner ..	Iona	21.10.07	W.J.C.
Chief Justice ..	5 years	T. Moroney ..	Wangaratta ..	15.8.07	S.S.C.
Clifton	Aged	L. Lynch	Mirboo	25.10.06	S.S.C.
Cocoanut	Aged	D. J. Ferguson ..	Seymour Show ..	11.10.07	W.J.C.
Combine	Aged	.. .. ..	Colac Show ..	24.10.07	S.S.C.
Comet	4 years	A. Billings ..	Colac Show ..	24.10.07	S.S.C.
Comet	..	F. Shelby ..	Geelong	31.8.07	S.S.C.
Comet	Aged	Talbot Atkins ..	Korumburra ..	29.9.06	S.S.C.
Comet	..	W. Ritchie ..	Bunyip Show ..	26.2.08	W.R.
Commander ..	Aged	W. Townsend ..	Pyramid Hill ..	3.8.07	S.S.C.
Commodore ..	Aged	Jno. Ince ..	Geelong	31.8.07	S.S.C.
Crown King ..	5 years	J. Dwyer	Camperdown .	26.9.07	W.J.C.
Cymro II.	Aged	J. R. Jackson ..	Hamilton .. .	17.8.07	W.R.
Cyndet	6 years	J. A. Manson ..	Maffra	16.8.07	W.J.C.
Dan Daphne ..	3 years	J. Stafford ..	Warrnambool ..	10.9.07	W.J.C.
Dandy	6 years	G. Tory	Traralgon Show ..	13.11.07	W.R.
Dandy	Aged	A. Bilston.. ..	Casterton	28.8.07	W.R.
Dandy	*3 years*	*R. Rennie..* ..	*Alexandra*	*14.9.07*	*W.J.C.*
Dandy Bell ..	5 years	Jno. James ..	Colac Show ..	24.10.07	S.S.C.
Dandy Dick ..	6 years	J. Findlay.. ..	Alexandra	14.9.07	W.J.C.
Dandy Geordie ..	4 years	T. G. McKenzie ..	Yarram	21.8.07	N.M.
Dandy Imperial ..	4 years	—. Bones ..	Donald	14.8.07	W.J.C.
Dandy Jock ..	5 years	A. Ward	Seymour Show ..	11.10.07	W.J.C.
Dandy Junior ..	5 years	Widdis and King ..	Traralgon Show ..	13.11.07	W.R.
Dandy Lad ..	3 years	J. Donegan ..	Murchison Show ..	30.10.07	W.R.
Dandy's Pride ..	3 years	W. Widdis ..	Traralgon	31.7.07	S.S.C.
Dandy's Pride ..	Aged	C. Jones	Geelong	31.8.07	S.S.C.
Desert Lad ..	3 years	D. Shelly	Ballarat Show ..	17.10.07	S.S.C.
Diagram	4 years	W. Rainey ..	Maffra	16.8.07	W.J.C.
Duffy	5 years	J. McKenzie, junr. ..	Yarram	21.8.07	N.M.
Emulator Junr. ..	5 years	Franklyn and Scown	Hopetoun	3.8.07	W.J.C.
Federation	5 years	R. Davidson ..	Euroa	14.8.07	S.S.C.
First Landor ..	5 years	Geo. Connor ..	Colac	7.8.07	S.S.C.
Flashwood ..	5 years	Jno. Griffin ..	St. Arnaud.. ..	28.8.07	W.J.C.
Forest Boy ..	6 years	L. Fawkner ..	Morwell	16.9.07	W.J.C.
Galloway	..	.. .. ..	Horsham Show ..	24.9.07	S.S.C.
Garfield	Aged	R. A. Gibson ..	Hamilton Show ..	19.9.07	N.M.
Gladstone	Aged	—. Collins ..	Tatura	24.8.07	W.R.
Glengarry	..	T. W. McCullogh ..	Warrnambool ..	10.9.07	W.J.C.
Grey Steel ..	6 years	S. McNabb ..	Maffra Show ..	24.10.07	W.J.C.
Griffo	Aged	T. Duffy	Colac	7.8.07	S.S.C.
Hamilton Emulator Junr.	5 years	W. H. Horn ..	Hamilton	17.8.07	W.R.

LIST OF CERTIFICATED STALLIONS—*continued.*

Name of Horse.	Age.	Owner.	Parade.	Date.	Officer.
		PONIES—*continued.*			
Harlequin ..	4 years	J. Daniel ..	Ballarat Show	17.10.07	S.S.C.
Heather Jock	Aged	R. Ballis ..	Warrnambool	10.9.07	W.J.C.
Heather Lea	Aged	Elson and O'Keefe	Nhill	21.8.07	S.S.C.
Here's Luck	4 years	F. C. Thomas	Warracknabeal	15.8.07	W.R.
Jimmy Governor	Aged	Wm. Nosedale	Melton	10.8.07	S.S.C.
Jno. Gilpin	6 years	J. Patterson	Mirboo	25.10.06	S.S.C.
Jno. Osterley Junr.	4 years	Thompson Bros.	Warracknabeal	14.8.07	W.R.
Johnny O'More	6 years	Wade Bros.	Grantville and Jeetho Show	16.1.08	W.R.
Kaizer II. ..	Aged	A. S. O'Keefe	Royal Show	7.9.07	S.S.C.
King Bally	Aged	Downey and Lumsden	Ballarat Show	17.10.07	S.S.C.
King Bally's Pride	3 years	F. J. Ebsworth	Ballarat Show	17.10.07	S.S.C.
King Billy	Aged	H. Jenkins	Hopetoun	3.8.07	W.J.C.
King James	5 years	Wm. Johnson	Foster	24.9.07	N.M.
King Jimmy	4 years	E. Wilson	Korumburra	29.9.06	S.S.C.
King Jimmy	Aged	R. Tankard	Maryborough Show	16.10.07	S.S.C.
Larry Boy ..	..	F. Clover ..	St. Arnaud	28.8.07	W.J.C.
Lawyer	Aged	A. Knight ..	Maffra	18.8.07	W.J.C.
Leetch	Aged	A. Ferguson	Casterton ..	28.8.07	W.R.
Leopard	Aged	H. Baldock	Kaniva	28.8.07	N.M.
Little Jim ..	Aged	—. Cahill	Benalla	17.8.07	S.S.C.
Little Jim ..	6 years	H. E. Beard	Colac Show	24.10.07	S.S.C.
Little Pride	Aged	W. H. Treloar	Nhill	21.8.07	S.S.C.
Little Tich	5 years	W. Hogan	Kyneton	26.9.07	W.R.
Little Wonder	Aged	J. White ..	Minyip	21.8.07	W.R.
Little Wonder	Aged	F. McDonald	Mansfield	30.8.07	W.J.C.
Lord Brassey	Aged	A. E. Miller	Stawell Show	18.9.07	W.R.
Lord Brassey II	Aged	A. Miller ..	Rupanyup	20.9.07	W.R.
Lord Dandy	5 years	Jas. Alexander	Traralgon ..	31.7.07	S.S.C.
Lord Roberts	Aged	J. Biggar ..	Korumburra	18.9.07	W.J.C.
Marbro' ..	Aged	J. Davidson	Warrnambool	10.9.07	W.J.C.
Micky Free..	Aged	J. McInerney	Dookie	27.7.07	W.J.C.
Midnight	Aged	J. O'Brien	Wangaratta	15.8.07	S.S.C.
Minstrel	4 years	R. N. Scott	Korumburra	18.9.07	W.J.C.
Monowai	Aged	S. Perrin ..	Mirboo	25.10.07	S.S.C.
Nelson	Aged	White Bros.	Lilydale	23.8.07	W.J.C.
Newbold	Aged	Thos. Brown	Elmore	26.8.07	W.J.C.
Nigger	Aged	P. Quirk ..	Sea Lake	15.8.07	N.M.
Pasha	..	—. Bones	Donald	14.8.07	W.J.C.
Peep of Day	Aged	W. G. Hicks	Seymour	29.8.07	W.J.C.
Planet	5 years	Neil McGilp	Minyip	21.8.07	W.R.
Planet	Aged	W. Raven ..	Yarram	21.8.07	N.M.
Pluto	Aged	J. M. Scott	Casterton	28.8.07	W.R.
Polo	Aged	Quinlan and McLean	Minyip	21.8.07	W.R.
President	6 years	A. and D. Parry	St. Arnaud	28.8.07	W.J.C.
Prince Bally	6 years	J. J. O'Mara	Morwell	16.9.07	W.J.C.
Prince Leo Junior	3 years	J. E. Phillips	Agricultural Offices	13.11.07	S.S.C.
Quercus	6 years	A. E. Callow	Ballarat Show	17.10.07	S.S.C.
Quicksilver..	Aged	P. Dore ..	Bunyip Show	26.2.08	W.R.
Robert	3 years	Vandamme and Foster	Agricultural Offices	23.10.07	N.M.
Rob Roy ..	..	J. R. and H. J. Manson	Maffra	16.8.07	W.J.C.
Rob Roy ..	6 years	W. J. Clarke	Warracknabeal	14.8.07	W.R.
Rhymney ..	5 years	C. T. Lucas	Colac	7.8.07	S.S.C.
Rosslyn ..	..	J. B. Bryan	Wangaratta	15.8.07	S.S.C.
Roy	3 years	Summerhill Stud Farm	Kyneton	26.9.07	W.R.
Roy	3 years	F. Von Kusseron	Euroa	14.8.07	S.S.C.
Royal Robin	Aged	H. A. Hancock	Colac	7.8.07	S.S.C.
Sam Weller	Aged	Jno. Hicks	Alexandra ..	14.9.07	W.J.C.
Shamrock ..	Aged	A. Ross ..	St. Arnaud	28.8.07	W.J.C.
Shamrock ..	6 years	A. Orr ..	Horsham	18.7.07	S.S.C.
Shroff King	Aged	R. H. Rundell	Hamilton ..	17.8.07	W.R.
Silverbells ..	Aged	W. H. Boston	Colac Show	24.10.07	S.S.C.
Sir Richard III.	5 years	Clarke Bros.	Korumburra	29.6.06	S.S.C.
Siva Junr. ..	5 years	G. F. Elliott	Mansfield ..	30.8.07	W.J.C.
Skipper	4 years	W. Braiser	Echuca	24.8.07	W.J.C.
Smithhill's Fireboy	3 years	W. B. Harper	Warrnambool	10.9.07	W.J.C.
Speculation..	Aged	Hay Bros.	Numurkah Show	9.10.07	W.J.C.
Sprightly ..	Aged	C. J. Bradbury	Leongatha Show	11.2.07	S.S.C.
Soda	Aged	—. Rogash	Benalla	17.8.07	S.S.C.
Souter Johnnie Junr.	Aged	Quinlan and McLean	Donald	14.8.07	W.J.C.
Steel Arrow	Aged	D. Ryan ..	Seymour ..	29.8.07	W.J.C.
Subadah ..	Aged	R. W. Noble	Geelong ..	31.8.07	S.S.C.

List of Certificated Stallions—*continued.*

Name of Horse.	Age.	Owner.	Parade.	Date.	Officer.
		Ponies—*continued.*			
Sultan	Aged	H. Gordon .	Tatura	24.8.07	W.R.
Sultan	Aged	M. Plante .	Horsham	18.7.07	S.S.C.
Sunrise (Arab) ..	6 years	A. Ferguson ..	Elmore Show ..	25.9.07	W.R.
Taffy (Welsh) ..	5 years	A. Williams ..	Traralgon Show ..	13.11.07	W.R.
Tam	Aged	—. Quinn ..	Camperdown Show ..	26.9.07	W.J.C.
Tam O'Shanter ..	6 years	H. Burness .	Benalla . ..	17.8.07	S.S.C.
Tam O'Shanter ..	Aged	J. M. Jones .	Jeparit Show ..	16.10.07	W.J.C.
Teviot (Arab) ..	Aged	J. Spark	Elmore	26.8.07	W.J.C.
The Bohemian ..	5 years	C. J. Colgan ..	Korumburra .	18.9.07	W.J.C.
The Count ..	5 years	T. B. Anderson ..	Maffra . .	16.8.07	W.J.C.
The Dude .. .	..	—. Hall	Mirboo .. .	25.10.06	S.S.C.
The Masher ..	3 years	Tompkins Bros. .	Casterton .. .	28.8.07	W.R.
The Premier ..	..	F. W. Briggs ..	Wangaratta ..	15.8.07	S.S.C.
The Souter ..	*Aged*	*Tompkins Bros.* .	*Casterton*	*28.8.07*	*W.R.*
The Warrior ..	4 years	-McKoy	Tallangatta Show ..	5.3.08	W.J.C.
Timmy	Aged	G. Bond	Morwell .. .	16.9.07	W.J.C.
Tommy	4 years	Jno. Turner ..	Alexandra	14.9.07	W.J.C.
Tommy Dodd ..	Aged	S. S. Davey ..	Pyramid Hill ..	3.8.07	S.S.C.
Tony .. .	4 years	W. Kennedy ..	Cobram	23.8.07	N.M.
Tyrone	Aged	A. W. Harvey ..	Kyneton .. .	26.9.07	W.R.
Utah	Aged	Malcolm Bros. ..	Hamilton	17.8.07	W.R.
Von Atom II. .	5 years	G. Padget ..	Minyip	21.8.07	W.R.
Wee Gibbee .	4 years	J. Devlin and Son ..	Murtoa	9.8.07	W.J.C.
Welsh Prince ..	Aged	B. Folliett-Sandford	Lilydale Show .	4.3.08	W.R.
What's Wanted ..	Aged	Ed. O'Keefe ..	Royal Show ..	7.9.07	S.S.C.
Young Aladdin ..	Aged	R. Kelly	Camperdown ..	26.9.07	W.J.C.
Young Australia ..	*5 years*	*J. A. Dalgleish* ..	*Stawell*	*18.9.07*	*W.R.*
Young Brigham .	4 years	A. S. Lucas ..	Colac	7.8.07	S.S.C.
Young Bringham ..	Aged	D. McGilp ..	Minyip	21.8.07	W.R.
Young Briton .	Aged	J. O'Keefe .	Murchison Show ..	30.10.07	W.R.
Young Briton .	5 years	W. G. Ballantyne ..	Dookie	27.7.07	W.J.C.
Young Briton .	..	Heinz Bros. ..	Ballarat Show ..	17.10.07	S.S.C.
Young Dandy II. .	5 years	A. E. Officer ..	Horsham	18.7.07	S.S.C.
Young Doctor .	Aged	W. Kennedy ..	Nhill	21.8.07	S.S.C.
Young Garfield ..	Aged	.. .. ..	Horsham Show ..	24.9.07	S.S.C.
Young General ..	Aged	W. Marshall ..	Lilydale	23.8.07	W.J.C.
Young Haukham .	3 years	Jas. Baker ..	Shepparton	24.8.07	S.S.C.
Young Hero ..	3 years	Alex. Scott ..	Korumburra ..	29.9.06	S.S.C.
Young Hero ..	Aged	A. J. Phillips ..	Mansfield	30.8.07	W.J.C.
Young Hero ..	Aged	T. Moss	St. Arnaud ..	28.8.07	W.J.C.
Young King Charles ..	4 years	—. Culvenor ..	Maryborough ..	16.10.07	S.S.C.
Young Nelson .	6 years	Jno. Paterson ..	Numurkah Show ..	9.10.07	W.J.C.
Young Robin .	Aged	J. Taylor, jun. ..	Dimboola Show ..	11.10.07	S.S.C.
Young Sailor .	Aged	J. F. Kirby ..	Coleraine Show ..	6.11.07	W.J.C.
Young Silver King ..	5 years	A. T. Darling ..	Rupanyup Show ..	20.9.07	W.R.

A NEW APPLE PEST.

Mr. C. French, Government Entomologist, states that, during the last few weeks, the larvæ of the Cup Moth, so well known as a partial destroyer of our eucalypts, have been found attacking apple trees at Avenel. Inspector Wallis has informed Mr. French that another case has since occurred at Mangalore.

This pest will require careful watching as the larvæ are exceedingly voracious and are occasionally to be found in countless thousands. The Cup Moth will be figured in Part IV. of the *Destructive Insects of Victoria*, which is now nearly ready for press.

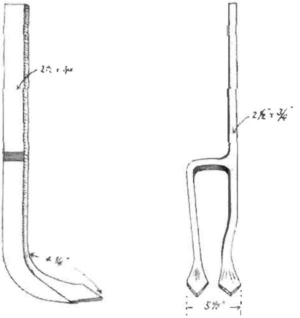
COVER ILLUSTRATION.

The stallion illustrated on front cover is "Kinloch" (imported from New Zealand), 4 years, the property of Mr. W. J. Bodey, Murtoa. He was very successful in the Wimmera show yards during the past season.—Editor.

A NEW SUBSOILING FOOT.

A. S. Kenyon, C.E., Engineer for Agriculture.

Mr. R. Kemp, of Durham Ox, in the Loddon District, has invented a new form of subsoiling foot, which promises to do good work. It, as shown in the illustrations, is attached to the beam of an ordinary plough,



SIDE VIEW. FRONT VIEW.

following the share and mouldboard and tearing up the bottom of the furrow. It is forked, having two points shaped and set at an angle as shown. It is claimed, and the claim appears justified by results, that

TWO-FURROW PLOUGH, WITH SUBSOILERS ATTACHED.

the draught is much less than for the single foot while the stirring is more thorough and effective. It will work to a depth of 4 or 5 inches below the sole plate, and serves to keep the plough in the ground when running into

hard patches, old tracks, &c. Indeed, it may be very useful if used for that purpose only. Instead of ploughing 4 to 5 inches with the risk of bringing up more or less of the subsoil, the plough may be set for a bare 3 inches and the subsoiler set for say 2 inches lower. This will give complete turning over and stirring for a depth of 5 inches with less draught than if ploughed to the same depth at one operation. Mr. Kemp states that at Sea Lake in the Mallee District, the adoption of the above device resulted in a crop of over 5 bushels to the acre in a drought year while in the same paddock ploughed in the ordinary way, the results were much less, 3 bushels only, in fact. The patentee has added an ingenious arrangement of levers for lifting the foot out of the ground for turning, &c.

Too great stress cannot be laid upon the advantages of deep stirring of the soil, both for dry and irrigation farming, so long as the subsoil is kept in its place and not brought to the surface, and this new foot is a welcome addition to the farmer's appliances for such a purpose. It is intended to use the attachment in some of the subsoiling experiments to be carried on at the Wyuna Irrigation Farm this season.

A NEW REACTION DIFFERENTIATING RAW MILK FROM HEATED (PASTEURIZED) MILK, AS WELL AS FOR THE DETECTION OF HYDROGEN PEROXIDE.

W. Percy Wilkinson, Government Analyst for Victoria, and Ernst R. C. Peters, Analyst, Government Laboratory, Victoria.

The chemical methods at present in use for distinguishing raw milk from boiled milk (or milk heated above 78-80 deg. C.) are based on :—

1. Coagulation of the casein and detection of albumen in the serum filtrate.
2. The property of unboiled (raw) milk of liberating oxygen from hydrogen peroxide, and detection of the nascent oxygen by suitable reagents.

The processes which are based on the coagulation of casein and detection of albumen in the filtrate are mostly too tedious and troublesome for practical purposes, for this reason the methods of class 2 are usually adopted. Babcock[1] discovered in 1889 that raw milk possesses the property of decomposing hydrogen peroxide forming nascent oxygen and water, while boiled milk does not. The reason for this decomposition was investigated by a number of chemists and several theories were suggested. Dr. Neumann Wender[2] in an interesting article on the enzymes of milk concludes that the action is due to an enzyme which he termed peroxydase, an anaeroxydase, which possesses the property of liberating oxygen from peroxides and transmitting the same to oxidisable substances. This enzyme is destroyed by heat and becomes inactive at a temperature of about 78 deg. C.

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[1] Babcock, S.M. The Constitution of Milk, &c., Bull. No. 18, Agr. Exper. Stn. University of Wisconsin, Madison, 1889.

[2] Oesterreichische Chemiker-Zeitung, 1903, 6, 1.

V. Storch[3] with the object of utilizing this property of raw milk as a basis for a differentiative test searched for a substance which if acted upon by nascent oxygen would produce a colour change. He found potassium iodide-starch to be a very suitable reagent for this purpose. He further suggested and tried various organic compounds, such as guaiacol, hydroquinone, α-naphthol, paraphenylendiamine, pyrogallic acid, &c., and finally declared paraphenylendiamine to be the most suitable reagent. This compound in presence of the oxygen liberated from hydrogen peroxide causes a greyish blue colouration in milk.

After Storch published his results the question was closely followed up by numerous investigators who critically tested his methods. F. Schaffer,[4] Utz,[5] M. Siegfeld[6] and others agreed with Storch, in view of their own experiments, that paraphenylendiamine is the most suitable reagent. du Roi and Köhler[7] however favoured a less costly chemical than paraphenylendiamine and experimented with potassium iodide and starch which had previously (in 1899) been suggested by Storch but condemned by him as not being sufficiently sensitive. Later on, Utz[8] as the result of further experience agreed with du Roi and Köhler's finding, viz., that the potassium iodide-starch process is of greater practical importance than Storch's for the reason that paraphenylendiamine will not keep long, and that it is too costly. M. Siegfeld[9] in 1903 subjected all the known methods to critical examination and concluded that paraphenylendiamine deserves first place among the methods, and subsequently the paraphenylendiamine process was selected as the official method for use in milk analysis in Italy (1904), France (1905), Switzerland (1905).

Although the paraphenylendiamine process is now almost universally adopted, it possesses several disadvantages. In addition to the two objections raised by du Roi and Köhler and Utz, that the chemical is too costly and does not keep well, there is another objection: the reaction is far from being perfect in the case of raw whole milk. Bearing these defects in mind we have endeavoured to find a more sensitive test than that based on the use of paraphenylendiamine for identifying the oxygen liberated from hydrogen peroxide by unboiled milk and have found a suitable reagent in the organic base Benzidin (paradiamidodiphenyl $NH_2(C_6H_4)_2(NH_2)$). An alcoholic solution of benzidin acetate when brought in contact at ordinary temperature with a solution containing nascent oxygen immediately develops an intense blue colouration. The reaction is carried out in a manner analogous to that with paraphenylendiamine:—To 10 cc. of the milk to be tested are added 2 cc. of an alcoholic solution of Benzidin, then 2 to 3 drops of glacial acetic acid (just sufficient to cause coagulation of the milk) shake the whole, and finally add 2 cc. of a 3 per cent. solution of hydrogen peroxide. If the milk is unboiled or or if it has not been heated to above 78 deg. C. an intense blue colouration is immediately produced. Milk which has been heated to above 80 deg. C. does not show any change by this treatment. It is advisable to pour the hydrogen peroxide solution slowly into the tilted test tube

[3] V. Storch 40de Beretning fra den Kgl. Veterinar. og Landbo-hojskoles Laboratorium for landekonomiske Forsog. Kjobenhavn, 1898, A. Bang, 46S.
[4] F. Schaffer, Schweiz. Wochenschr. Chem. Pharm. 1900, 38, 169 and 209.
[5] Utz, Pharm. Centrh. 1901, 42, 140-150.
[6] Siegfeld, Milch Zeitung 1901, 30, 723-725.
[7] Milch Zeitung, 1902, 31, 17-18.
[8] *Milch Zeitung*, 1902, 31, 145-146.
[9] Zeitschr. fur angewandte Chemie, 1903, 764.

allowing it to run down the side of the tube instead of mixing with the milk. In the paraphenylendiamine test the colouration produced is more or less dirty slate-blue. We have found that the depth of the blue colouration produced by the Benzidin test in milk heated to any temperature up to 75 deg. C. is intense, and have made comparisons with other methods including the paraphenylendiamine and guaiacum tests to determine at what temperature milk ceases to give the reaction. The reactions obtained by these substances with milk heated to various temperatures between 70 and 80 deg. C. are summarised below :—

Temperature to which milk was heated.	Paraphenylendiamine test.	Guaiacum Test.	Benzidin Test.
70 degrees ...	Positive intense ...	Positive intense ...	Positive intense
75 " ...	" " ...	" " ...	" "
77 " ...	Positive less intense	Positive ...	Positive less intense
78 " ..	Positive faint ...	Negative ...	Positive faint
79 " ...	Negative ...	" ...	Negative
80 " ...	" ...	" ...	"

Thus it is seen that, as in the other methods, the reaction ceases to be given by milk heated to above 78 deg. C.

We also prepared mixtures of fresh milk and boiled milk and determined the proportion of raw milk detectable in boiled milk by the Benzidin process and found that with 15 per cent. of raw milk in boiled milk the colour reaction is quite positive. When the proportion is 10 per cent. the reaction is less distinct and 5 per cent. of raw milk no longer gives a colouration.

The advantages of the Benzidin test are :—

1. The reaction is more reliable than either the guaiacum or potassium-iodide test.
2. It is more sensitive and more intense than the paraphenylendiamine test.
3. The cost of Benzidin is only one-eighth that of paraphenylendiamine, and one-third that of potassium iodide the reagent favoured by various authors as being cheaper than paraphenylendiamine.
4. The alcoholic solution of Benzidin when stored in a stoppered bottle will keep for a long time. A solution prepared in October, 1907, was still usable in March, 1908, after a period of five months.

The usefulness of Benzidin as a test for unboiled milk may be extended by reversing the reaction and applying it as a very sensitive test for hydrogen peroxide. Unboiled milk is treated with the Benzidin solution and acetic acid and the solution to be tested for hydrogen peroxide added. In presence of a trace of hydrogen peroxide an intense blue colouration is immediately produced.

We have used this method in the Government Laboratory of Victoria for the past twelve months in the course of routine milk examinations.

THE ORCHARD.

James Lang, Harcourt.

The weather still continues dry, and a good downfall of rain is very much required to enable orchardists and farmers to get on with necessary work.

The export of apples will cease early in the month, so that orchardists will be enabled to start gathering the crop of apples and pears for storing. Apples and pears seem to be maturing earlier this year; growers will need to be on the lookout, and pick each variety as it is ready, and so avoid undue waste through the fruit falling off. Great care should be exercised in gathering the fruit; handle carefully, and put all that are bruised and blemished in cases by themselves to be sold at once. It will pay to do this, as the sound fruit will keep much better, and for a longer time, and can then be sent to market as required.

Where it is intended to sow peas in the orchard for green manuring, the ground should be ploughed as soon as practicable. It is essential for the success of the crop that the peas should be sown as early as possible, while the ground is warm. They will then get a good start before the cold weather sets in and a good growth to plough in during the spring will be assured. The sowing of the peas should not be delayed after the middle of May, as that is the latest that peas can be sown with any prospect of success. If sown later, they fail to make a good start and do not make sufficient headway to do any good by the time they should be ploughed in.

Red spider has been very much in evidence on the fruit trees during the summer. Its presence can be noticed by the leaves of the trees becoming pale green and yellow in colour, with a very glazy appearance; in bad cases the leaves burn off altogether. This pest is best dealt with during the winter months when the trees are bare of leaves; emulsions made with kerosene, red oil, or crude petroleum, are all very effective remedies. As the spider harbors on the underside of the branches and small fruit spurs, it will be necessary to spray so that the underside of the branches gets the full benefit of the emulsion.

Towards the end of the month is a good time to plant citrus fruits of all kinds. If the ground is dry, give a good soaking with water.

Strawberries should be planted as soon as the weather is favorable. Plantations are better if renewed every three years.

Preparing ground for extending the orchard, or for the planting of a new orchard, should be taken in hand as soon as possible. This work is best done before the ground gets too wet. Draining, where necessary, should also receive attention.

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Vol. VI. Part 5. 8th May, 1908.

IRRIGATED AGRICULTURE IN THE GOULBURN VALLEY.

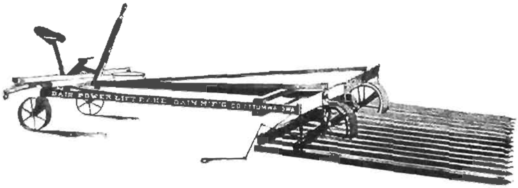
Elwood Mead, Chairman, State Rivers and Water Supply Commission.

The irrigation of land wholly arid is usually quite simple. Every one welcomes the canal as a means of escape from intolerable conditions. Those who do not like irrigation go elsewhere. Those who remain are of one mind. They all believe in irrigation, and practise it. It is different in semi-arid districts. The conditions are more complex. Opinions as to the benefits of irrigation are at the outset always divided. The ardent

STACKING LUCERNE HAY.

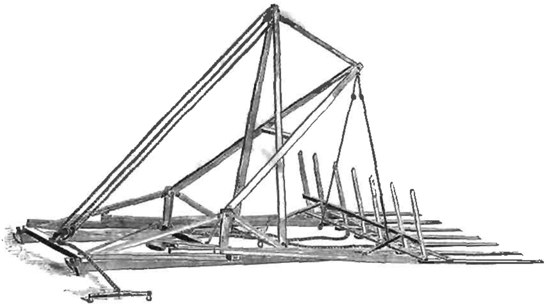
convert to irrigation during a drought becomes a backslider when it rains. For a time, at least, there is a reluctance to submit to the order and system which irrigated agriculture requires, and a continual balancing of the merits and drawbacks of watering from canals or from the clouds. Nevertheless, irrigation once begun is never abandoned. Two very noted irrigation areas, Northern Italy and Northen California, are both semi-arid.

In semi-arid districts irrigation, as a rule, follows settlement. When it comes it displaces a kind of agriculture which is understood, and which suits many better than irrigation, and it often brings requirements and imposes outlays which were not foreseen. The irrigation canal does not of itself create irrigated agriculture. Let me illustrate.



HAY SWEEP OR HAY RACK.

North of Cremona, Italy, is an irrigated district which has a rainfall of about 40 inches a year. Irrigation there is not a climatic necessity; the land had been farmed for unnumbered centuries before any canals were built. About twenty years ago three dry years followed each other in succession; on all unirrigated lands there was a total failure of crops. The losses incurred by landowners gave irrigation a new impulse. It was shown by calculations that the value of the crops ruined by drought would have paid for a canal from a never-failing supply. Spurred on by this experience, the farmers formed an irrigation district, mortgaged their land to secure the needed money, and built a canal which cost £400,000. I



HAY STACKER IN POSITION FOR RECEIVING LOAD.

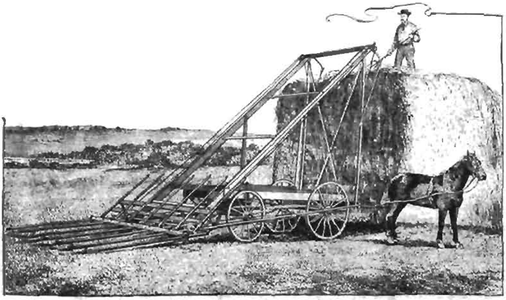
visited the district six years after the canal was completed. It was a financial and agricultural success. The interest on the money borrowed had been paid; the payments to the sinking fund had been anticipated. Rates had been twice lowered, because the income from the canal provided more money than was needed.

Notwithstanding all this, there were some farms which were not fully irrigated, although every acre of land paid the irrigation charge. I asked a farmer the cause. He was, for Italy, a large landowner, having, as I

STACKER IN OPERATION.

recall, something over 300 acres. He said, "It takes twice as much labour to cultivate an acre of irrigated land as it does to cultivate an unirrigated acre, and it needs three times as large a barn to hold the crop. In order to change from unirrigated to irrigated farming, I must build more houses for my men and more barns for my crops. I am adding to my irrigated area as rapidly as I can provide money for these buildings."

Now, these farmers thought when they began that all that was needed to have irrigation was a canal. They found that the canal made necessary an entirely different style of farming. There were larger and surer crops,

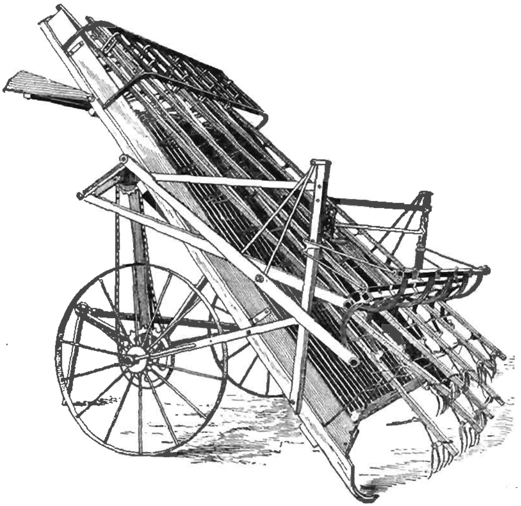


ANOTHER FORM OF STACKER IN POSITION FOR RECEIVING LOAD.

but there was need also of more outlay for men, houses, and barns. That experience has been repeated many times, and it will be repeated here. If Trawool is built, there will be water to irrigate 750,000 acres instead of

50,000 acres now irrigated. To prepare the land and irrigate and harvest the crop will require more than twice as many men as now live in this valley. There must be far more new houses for men and new barns for crops than in the Italian district, because there are far less to begin with.

In many ways we are making satisfactory progress in doing this. Every new butter factory is a preparation for Trawool. Every acre of orchard or vineyard planted is a step in the right direction. Wyuna will be the forerunner of other closer settlements, and is a step toward using the water which the Goulburn storages will render available. There is, however, one irrigation crop which deserves more attention. I propose to discuss



HAY LOADER—FOR ELEVATING ON WAGGONS.

it, and shall take as my text, "Make hay while the sun shines," and especially make lucerne hay. This plant has been so long known to agriculture that history does not record its beginnings. It is older than the campaigns of Xerxes, for his war horses were fed on it. It was introduced into Peru over 400 years ago by the conquering Spaniards, and the good it has done in that country since in some measure atones for the miseries the conquest wrought. It is not only one of the oldest plants adopted by man for his service, but in warm dry climates is the best.

Lucerne hay is the leading crop in the irrigated districts of America. It is grown for hay rather than pasture in the irrigated districts of Southern Europe. *Why is it so little grown here?* Its absence in the

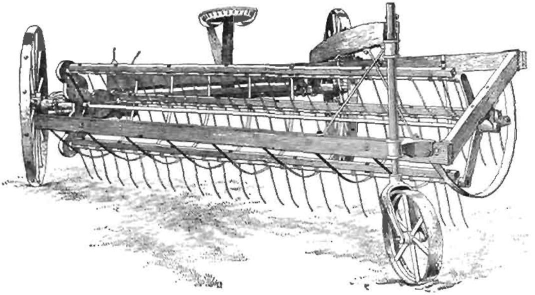
agriculture of the Goulburn Valley is a problem not yet solved. Two causes have been given. Absence of a market for hay, and that it cannot be grown at a profit on this soil. The first is not important, if there is not now a market for this hay there soon will be, and there is *now* a market for fat cattle, fat lambs, fat pigs, and poultry. For producing all these *there is no food equal to lucerne hay.* It is the richest and the most palatable forage crop grown. There is no feed equal to it for work horses or horses thin in flesh. Some of the best thoroughbred horses in the United States come from lucerne growing districts; and it is the *only* hay fed to many noted running and trotting horses. Lucerne hay is one of the best foods for the milking herd, because it contains all the elements of which milk is composed. In combination with silage made from maize, it is as good a ration for the dairy herd as can be provided.

THE LOADER PUSHING THE HAY FORWARD ON THE LOAD.

In all this Commonwealth there is no question more important than what is the best food for sheep. The answer is lucerne. There is no food they like better, or one better suited to their needs. I wish the flock raisers of Victoria could visit some of the irrigated districts of America, and see the magnificent proportions which lamb fattening on lucerne hay has assumed. During the whole of the long summer there are hundreds of farms where the click of the mower never stops in the daylight hours except when interrupted by rain. Long ricks containing hundreds of tons are built up for use in the feeding season. To this come lambs from distant pastoral districts; they are placed in near by feeding lots and fattened by the hundred of thousand on lucerne hay with a little maize, barley or wheat added. Before lucerne was grown, in what is now one of the largest lamb fattening districts, land would not sell for £5 per acre; to-day it will average £25. Then the average yield of wheat was 12 bushels, now it is over 30.

The second reason given for the small area of lucerne hay is that the soil is not adapted to it. If this is true, it is a serious matter, for there is no crop that will take its place. Some of the meadows I have examined were certainly failures. The question is, were those failures due to some quality of the soil which cannot be remedied, or to methods of cultivation which cannot be changed. In all the poor meadows examined the ground needed manuring, more small channels with shorter distances between would have given more even watering, and some fields showed the

ill-effects of trampling in winter. *On the other hand, I have seen good meadows in the Goulburn Valley.* There is one of 50 acres on the Wyuna farm, and I have seen smaller patches elsewhere. Still the showing, as a whole, is disappointing. Surmise and speculation will, however, settle nothing; the only way we can prove it is a hay growing district is to grow hay in paying quantities. It was to test this that the Commission rented a plot of land at Tatura. We are not doing this to show any one how to grow hay, but to find out if it can be grown at a profit. But our work is not enough. We might fail where some practical farmer would succeed. Hence we offered prizes to encourage such farmers to experiment. If many go into the matter the competition will have life and good fellowship, and those who try will learn more than those who look on.



SIDE DELIVERY RAKE.

One thing is certain, *if it will not pay to grow lucerne for hay it will not pay to grow it for pasture.* It is a fodder not a pasture plant. The high food value is in the mature plant; the young plant is chiefly water. As a hay it uses the whole season and the whole of the soil. The latter is of special importance in this Valley where the heavy clay subsoil needs the action of air, water, and vegetable matter. The root of the lucerne plant develops as the top develops, the more leaves and stem there are the stronger and larger the roots. The lucerne roots in a well established meadow sink deep into the tenaceous clay opening it up, making avenues for air and water to follow, and filling it with vegetable substance on which later generations of plants may feed.

More important than all other considerations is the fact that the most useful functions of irrigation canals in Victoria is to lessen the hazards and losses of dry years, to save money and relieve the misery of helpless starving dumb animals. *This purpose will never be fulfilled so long as the land under canals is used as pastoral areas. When dry years come the irrigator is protected, but he is in no condition to extend aid to the pastoralist on non-irrigated land.* Irrigating pasture land creates no surplus forage; to do this we must grow and store hay. For this purpose no crop equals lucerne hay. I want you to consider what 100,000 tons of hay would have been worth to its owners this season, and what the ability to

buy it would mean to the owners of cattle and sheep who live above and beyond the canals. If we had begun this season with 25,000 acres of Lucerne meadow the hay from it would have made the owners the stock men's bankers for the next five years. What is true of this year will be true of regularly recurring years so long as this continent endures.

In order to grow hay on a large scale we must have improved tools. No work is harder than making hay by human muscle. I know, because as a boy I cut many acres of hay with a scythe. On the other hand, no farm work is easier or more agreeable than making hay by machinery. I know that also from trial. American inventors have done almost as much to cheapen and lighten hay-making as Australian inventors have done to cheapen and lighten the labour of harvesting grain. The purpose of the accompanying illustrations is to show more clearly than any description could the appearance of modern hay-making tools and the method of their operation.

THE ELEMENTS OF ANIMAL PHYSIOLOGY.

W. A. *Osborne, M.B., D.Sc., Professor of Physiology and Histology, Dean of the Faculty of Agriculture in the University of Melbourne.*

(*Continued from Page* 764, *Vol.* V.)

X. Digestion and Absorption (*continued.*)

DIGESTION IN THE SMALL INTESTINES.—In the duodenum the food mass or *chyme* as it is called, encounters the pancreatic juice and the bile, concerning the secretion of which a few words may be now said. In the wall of the duodenum is a substance called *prosecretin* which is held fast by the epithelial cells. When, however, this substance comes into contact with an acid it is changed into another body called *secretin* which is liberated by the cell, is caught up by the blood stream and so reaches eventually all parts of the body. Now secretin is a true hormone or chemical messenger, for it acts on the pancreas causing this to secrete pancreatic juice; it also acts on the liver causing this to secrete bile; and it probably acts on the duodenal tubular glands causing these to secrete *succus entericus*. The mechanism is therefore simple. The stomach content or chyme is acid; it liberates therefore secretin; the pancreas and liver are stimulated therefore to secrete and, as their secretions are alkaline, it follows that they will continue to be stimulated until the acid of the chyme is neutralized; when this happens no more secretin will be formed and the activity of the pancreas and the liver will come to a halt. But when a fresh squirt of chyme is sent into the duodenum the same cycle will start over again.

The pancreatic juice is in many respects the most important digestive secretion in the body. It contains the following ingredients besides water and a little protein:—

1. *sodium carbonate*, about 0.6 per cent., which neutralises the acid of the chyme, emulsifies the fats and oils and to which the alkalinity of the juice is due,
2. *lipase*, called also *steapsin* which splits fats into fatty acids and glycerine,

3. *diastase* called also *amylopsin* which transforms starch and dextrins into the sugar maltose,
4. *erepsin* which transforms proteoses into amino-acids,
5. *protrypsin* a proferment which has in itself no action, but which, by coming into contact with a constituent of the succus entericus called *enterokinase*, is transformed into trypsin a remarkably powerful ferment, which changes proteins into amino-acids.

The bile is a fluid of a yellow or greenish tint and with a characteristic taste. It contains, besides some 92 per cent. of water and in most cases a little protein, the following bodies :—

1. *bile salts*, which are compounds of sodium and potassium with complex organic acids (*glycocholic* and *taurocholic acids*). The importance of these salts is to be found in their power of dissolving fatty acids which would otherwise be insoluble. These salts being alkaline also help in neutralising the chyme.
2. *pigments*—to be looked on as excreta and probably due to the broken-down red colouring-matter of the blood,
3. *lipoid*—probably from the corpuscles of the blood and to be looked on as waste matter.

The succus entericus of the duodenum and small intestines is a more dilute fluid containing besides mucin :—

1. *enterokinase*, which transforms protrypsin into trypsin,
2. *erepsin*, which transforms proteoses into amino-acids,
3. *maltase*, which transforms maltose into glucose,
4. *lactase*, which transforms lactose into glucose and galactose,
5. *invertase*, which transforms cane sugar into glucose and levulose.

The chyme, neutralised and mixed with bile and pancreatic juice, is urged along the small intestine by peristalis, receiving succus entericus on its way and having a certain amount of digested material absorbed from it. The course of digestion here may be summarized as follows:—The undigested and semi-digested proteins of the chyme are attacked by trypsin and disintegration into amino-acids commences. The proteoses present undergo the same change through the presence of erepsin. Fat is split by the lipase into glycerine and fatty acids which latter are dissolved by the bile. Starch and dextrins are broken down into sugar by the diastase and compound sugars are split into simple sugars by the ferments of the succus entericus. The sojourn of the chyme in the small intestine is not nearly long enough for these changes to be completed; the ferments are added and the action begun but the completion of the process takes place in the lower tracts of the bowel.

Absorption in the small intestine can be shown to be undoubtedly present and affecting all classes of food but especially the fats and sugars. The fatty acids dissolved in bile, together with the glycerine, are absorbed by the lining cells and recombined into fat. The fat in the form of small globules is carried by white cells capable of movement into the central lacteals of the villi and thus sent into the circulation by the lymphatic system. A small portion does not do so, however, being either absorbed directly in the blood stream and sent on to the liver, or retained as fat in the gut wall. The simple sugars, dextrose, levulose and galactose, and the products of protein digestion are absorbed as soon as they are formed and come in contact with the villi of the mucous membrane. The path of their absorption is undoubtedly through the blood vessels passing thence to the portal vein and liver, but the fate of these digested products is rather shrouded in mystery. The little that is known may be briefly

epitomised as follows. There undoubtedly occurs in the liver a break-up of part of the amino-acids into urea and carbon compounds, the former being excreted by the kidney, the latter being used as fuel-food or stored as such. In the liver also a polysaccharide called glycogen can always be found. This glycogen increases in amount after the administration of a food rich in carbohydrate and diminishes when the animal is actively exercised. Now glycogen is readily transformed into glucose and glucose is found in the blood, but never above a certain small percentage, and it has therefore been suggested that the liver, by means of its glycogen store, keeps the sugar content of the blood up to its normal figure. Part of the digested protein is reformed into true protein taking its place as such in the blood but where this occurs whether in the bowel wall, in the blood, or in the liver, is difficult to say. Sugars can be changed, as above stated, into glycogen but this change accounts only for a fraction of the total amount absorbed, the rest may probably be altered into fat but in what organ we do not know. An extraordinary fact bearing on this problem of absorption is that, when the pancreas is removed from an animal, or even if it be merely freed from its attachment to the duodenum, sugar appears in quantity in the urine, the animal becomes emaciated and finally dies. This condition is known pathologically as *diabetes* but of its origin and significance we know nothing. Water is absorbed to a slight extent in the small intestines making the contents less fluid than the chyme. The bile salts are absorbed, returned to the liver, and neutralised by that organ. The cholestrin apparently escapes absorption.

The activity of the small intestine is governed largely by the food. Each compound sugar for instance, can excite the secretion of the appropriate ferment; and the texture of the food can influence the rate and intensity of peristalsis. But the central nervous system has a considerable control over the small intestine. Thus during active exercise, when a large number of muscles are employed, the blood vessels of the intestine constrict and digestion is checked; moreover the emotional state of the animal has, as is well known, considerable influence, whether favourable or unfavourable on digestion.

DIGESTION IN THE CÆCUM.—The cæcum is small in carnivores and man, of moderate size in ruminants and the pig, and very large in the horse. The entrance from the small intestine is controlled by a sphincter called the *ileocæcal sphincter* which in some animals is guarded by a valve-like fold of mucous membrane. In carnivores and man the cæcum functions as part of the colon; but in solipeds, ruminants and the pig, it is a digestive organ of considerable moment. Perhaps the longest sojourn that the food mass makes in its passage through the alimentary canal is made in the cæcum of these animals. In the solipeds its huge size marks it out as having special functions to perform: in fact when we compare the process of digestion in the horse with that in a ruminant we shall find that in the former animal the proventriculus is comparatively small whilst in the cæcum occurs most of the change which takes place in the rumen of the ruminants, with this exception, that in the cæcum autolysis is not present but is supplanted by the action of ferments brought by the food from the small intestine or excreted by the cæcal mucous membrane. Bacteria also flourish in the cæca of all mammals and it is a matter of debate whether their presence is not absolutely essential. Bacteria certainly help in continuing the digestion of proteins, carbohydrates and fats, but they can also act in a manner not beneficial. Thus a part of the carbohydrate becomes changed into gases, hydrogen, marsh gas, &c., and so loses its nutritive properties; and further, from the protein of the food, evil-

smelling, poisonous products are formed which are absorbed by the blood and carried to the liver where they are altered and their toxicity removed. This safe-guarding action is one of the chief functions of the liver and accounts for the very rapid onset of death after loss of this organ.

If there be excess of protein in the food, or if its absorption be delayed, then toxic bodies are produced in greater quantity than the liver can destroy, and they therefore get into the circulation producing muscular weakness, loss of fat, and general decline in health.

The cæcum secretes some ferments, and notably one that can digest and dissolve cellulose and woody fibre. The importance of this ferment *does not lie so much in the cellulose becoming fuel-food as in the fact* that, in the food that reaches the cæcum, much protein, fat and carbohydrate has remained unaltered through being enclosed in cells or lying between tough woody-fibres. In the cæcum these bodies are liberated, and their digestion begun. In the non-ruminating animals with small cæca, digestion of cellulose, if it occurs at all, must do so to a very limited extent. We may look on the cæcum therefore as an organ for continuing digestion. It probably has a little absorbing power. In the horse it functions as a water reservoir, serving the same purpose as the reticulum of the ruminant. When a horse drinks the water is said to pass rapidly through the stomach system, and even through the small intestine to be poured into the cæcal cistern.

DIGESTION IN THE COLON.—The colon varies in a remarkable manner in each species of animal, and little is known of the parts that are analogous in one species as compared with any other. Certain points as regards digestion in the colon may be given as definite—

1. Digestion continues and is terminated. It is doubtful if the succus of the colon has high digestive properties; most of the glands seem to turn out mucus which lubricates the lining membrane. Bacteria decrease in number in the colon as the rectum is approached.
2. The colon is the main absorbing portion of the whole alimentary tract. This is especially true as regards water, the fluid food-mass changing to semi-solid even solid fæces. Proteins are well absorbed, and to a lesser degree the carbo*hydrates and fats.*
3. The colon is an excretory organ. In starvation, or when the lower part of the colon is disconnected from the rest, it will be found that some fæces are passed. Experiment also shows that many substances, particularly metallic salts, leave the body by this channel.

THE FÆCES.—*In the lowest part of the colon the fæces collect, and* are moulded into the form characteristic for the animal. When the fæcal mass has reached the rectum, the act of defæcation is excited reflexly. The fæces consist of the indigestible and partly-digested portions of the food together with mucin and excretory products from the colon wall, altered bile pigments, cholestrin, remains of bacteria, and products formed by these. The character of the fæces depends on the species of the animal as well as the nature of the food, and the rate of peristalsis and absorption. The smell of fæces is due to bacterial products chiefly, and is especially offensive when the food contains excess of protein and too little ballast. The colour is partly due to altered bile pigment, and, in the case of vegetable eaters, to the altered chlorophyll or green colouring-matter of plants.

ST. JOHN'S WORT.

NOTES ON RESULTS OF CHEMICAL WEED ERADICATORS EXPERIMENTED WITH.

H. W. Davey, Inspector, Vegetation Diseases Acts.

In order to form an idea of the effect of chemical weed exterminators after several years, I revisited Bright on the 29th January to inspect the plots treated with chemicals for the suppression of St. John's Wort. I found the plots treated with Murton's Weed Killer during February, 1905, covered again with the weed, partly from the recovery of old established plants and partly from seedlings. These plots are in the Racecourse reserve running parallel with the Harrietville Road; the plots facing the grand stand are all covered with the weed but it is rather stunted as compared with the untreated weed outside the plots.

The three acres on the Harrietville Road which were fenced in for treatment are all once more infested. Plot 12 in this area was treated with ½ ton of salt on 29th November, 1904, and the weed was destroyed but the land has been reinfested from seeds washed down from land higher up the hill; the plot is on very steep land and every rain must wash a lot of seed down. Plot 11 in same paddock, treated with Invicta in October, 1904, is on the level country below the race and the kangaroo grass has held its own against the weed fairly well. In some spots the grass has beaten the weed badly, but I put this down to the moisture being especially favorable to the grass and adverse to the deep roots of the weed. Seed from the weed has not much chance against the grass especially as the latter is protected from being eaten out by stock.

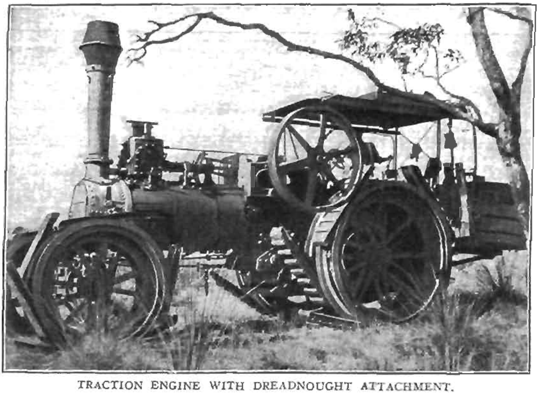
The only plots that look well are those adjoining the saddling paddock; these were treated in November, 1904. No. 1 plot treated with Bethanga pyrites, is still absolutely free of weed, except where a track cut by wood drays crosses it. On this track the weed has firmly established itself once again, but cannot encroach on either side of the track, proving that once the surface was broken by these ruts the rain washed the arsenic out of the soil and allowed the seed (which must be very plentiful in that locality) to germinate. The way in which the plant is confined to this track gives it a remarkable appearance. Plot 2 treated with arsenate of soda is fairly clean but the land is gradually recovering, and the weed is always at hand to grip the spot where rains have leached the arsenic out of it. Plot 3 (Murchison Scrub Exterminator) is the next best, then Plot 5 with Invicta, but the plots treated with Silex and Murton's Dip are both badly covered again with weed.

From the foregoing observations it appears to me that salt comes first as a remedy as it will kill out the weed and its effects on the soil are not so lasting as arsenical preparations or as dangerous, but unless land treated with salt is protected against fresh supplies of seed being blown or washed on to it, it is only a waste of labor. With regard to strong arsenical solutions the Bethanga plot proves that the weed can be utterly destroyed by strong arsenical solutions for lengthened periods—in this instance from 4th November, 1904, up to the present. This treatment would be useful for headlands; the weed growing in the wheel ruts on the Bethanga plot shows that arsenic killed land can be recovered by cultivation which allows the rains to wash out the poison.

CLEARING BY TRACTION ENGINE.

A. S. Kenyon, C.E., Engineer for Agriculture.

One of the difficulties met with in the use of the traction engine on the farm is the inability of the ground to supply sufficient resistance to the driving wheels to prevent them skidding. This is particularly the case after rains, in wet ground, and in sand. It is, of course, evident that the pull of the ploughs, trees, or whatever is being hauled by the engine, *must not be greater than the frictional resistance between the ground and the wheel.* Many expedients have been devised to overcome the difficulty. The traction engine has been evolved under "old country" conditions for use on good and hard roads, and fails at times when taken into the field. Grips, spikes, widening, and increasing the diameter of the wheels have all been tried. In the Western States of America, traction engines with wheels up to 16 feet in width of face are in use, while others have an arrangement similar to the horse tread-mill whereby they run on a continuous roadbed. In general, it may be said that the best method lies in the direction of wider wheels, though strength of axle considerations puts a practical limit to this.



TRACTION ENGINE WITH DREADNOUGHT ATTACHMENT.

An interesting problem of this kind arose in South Australia, and a satisfactory solution has been found by the adoption of a modification of an old contrivance known under various names, but more commonly as the pedo-rail. At Tintinara there occur large tracts of gum country, interspersed with the smaller grass tree, sedge, and black gum. The soil is white sand overlying clay, with occasional heavy limestone outcrops. Belts of mallee mingled with heathy vegetation show here and there. Large areas of true heath country, honeysuckle, oak, and scrub, are to be

found. The whole area forms part of the Ninety Mile Desert, and the name desert was formerly applied to the whole of it.

Recently the Triumph Plough Company, of Adelaide, secured about 60,000 acres of the old Tintinara run, and set about clearing it by steam to sell to farmers. The freehold is not parted with, but the right, acquired by the Company, to perpetual leases at ¼d. per acre per annum is transferred to the purchaser. For cleared land, that is, with the timber rolled or pulled down, prices of 15s. and upwards per acre are obtained for this once while desert.

In the gum country clearing is generally done by pulling down. The work is done by two traction engines, fitted with the "Dreadnought" attachment referred to later on. The engines work from 2 to 3 chains apart dragging between them an inch and a quarter steel wire rope about 6 chains in length. The engines go straight ahead, the loop or slack of the cable pulling down all trees or scrub stout enough to stand up against the rope. In the case of the larger gums, the men walking behind the cable nick the trunk some few feet up and lift the cable into it. Trees up to 3 feet in diameter and 60 to 70 feet in height are uprooted by these means. There is one driver on each engine who fires, steers, and drives, and four or five men follow the cable. In lighter gum or heavy

PULLING DOWN TREES WITH TRACTION ENGINES AND CABLES.

mallee, a heavy chain cable about 180 feet long attached at each end to the engines by about 100 feet of steel wire rope is used, the rope above referred to being too light to pull down the small stuff.

In the lighter mallee, rollers are used much of the ordinary type. One engine drags three of these, totalling 60 feet in width, with ease and could pull as much again. Pulling down with the wire rope in ordinary gum country, an average of 10 acres per day may be cleared. With the chain cable, up to 50 acres may be done, while with the rollers

even a greater area may be covered. The pulling is preferable as no snags and but few stumps are left behind.

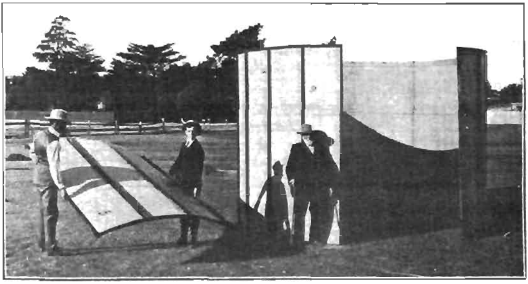
A waggon contrived from the wheels of a discarded engine, carries eight 400-gallon tanks or over 3,000 gallons of water, and is pulled by an engine to the seat of operations, the water being obtained from the bore at the railway station. This is sufficient for three days' work in mallee and six days in gum country. Firewood is supplied by a man and dray working about three hours per day, one ton measurement being burnt in gum and two in mallee country.

That the work described is possible upon such loose sandy soil is due to the invention of Mr. J. Bottrill, in charge of the works. The Dreadnought Patent, as it is called, consists of the attachment of eight or more bearers in two rows around the circumference of all the wheels. They are attached by steel cables to the rims of the wheels, and are screwed up tight by U bolts. The tread or face of the wheel is fitted with two grooves formed by angle iron flanges in which the bearers oscillate. The bearers are made of channel steel and are, in ordinary cases, between 4 and 5 feet long, and 1 foot wide with cross bars or grips for those on the driving wheels. These can be renewed as required. Inside the bearer are fitted two pieces of steel rail to take the wear on the rim. The contrivance can be better understood, perhaps, by reference to the illustration. The practical effect of the contrivance is that the wheel has a bearing surface on the ground of at least 4 square feet, rendering it possible to work on loose sand and probably on soft ground, though in marshy ground with much growth, clogging may take place. For hard roads the contrivance is not suitable, nor would it be any advantage; but on ordinary country roads or for farm work, it will greatly increase the efficiency of a traction engine. It does not, of course, add to the power but increases the proportion available for hauling by reducing the work done in shifting the engine. The best evidence of its usefulness is afforded by its work at Tintinara; where, before the addition of the bearers the engine under a full head of steam merely buried itself in the loose sand, it now goes along pulling down large trees without a sign of slip. Those who have had experience of engine work on sand will appreciate such an invention.

A PORTABLE SILO.

E. A. Ryland, Silo Supervisor.

Seeing that the modern method of conserving succulent fodder by means of the silo is a question in which all stock owners are vitally interested, perhaps a brief description of a simple and useful invention in the way of a silo will be appreciated by the readers of the *Journal*. The silo under review is manufactured by Mr. A. H. Russell, of 276 City Road, South Melbourne, and is made entirely of iron, in circular sections 9 feet high by 6 feet in width. These are of a convenient size for two men to handle, and are made up of three sheets (6 feet by 3 feet) of 24 gauge galvanised iron securely jointed by double folding or lapping. The outside studs or supports, of which there are three to a section, are $1\frac{1}{2}$ x $\frac{3}{8}$ steel angle iron. To these the galvanised iron is securely rivetted by strong rivets placed at intervals of $8\frac{1}{2}$ inches apart.



LOWER HALF OF SILO SHOWING SECTION.

The circular shape is kept by two angle irons running horizontally, one at the top and one at the bottom of the section. They are bored with $\frac{3}{8}$ inch holes on the flat so that the bottom section may be secured by spiking or bolting to sleepers or blocks in the ground, and by this means the silo can be made a permanent fixture if so required. The second section is secured by simply bolting it to the bottom section by means of the band of angle iron. The capacity of the silo is increased or decreased by the number of sections used, according to the quantity of fodder to be conserved.

The iron studs are conveniently bored to allow of the silo being stayed when empty, by means of wire guys; the studs also admit of a ladder being fitted to the side for access to the portholes. The joints between the sections are packed by a strip of steam packing material, and thus the whole silo when erected becomes practically airtight. The portholes are made one to each six feet in height, the same distance apart as in the silos built by the Department of Agriculture. The doors, constructed of the same material as the wall, are attached outside by bolts and nuts, three on each side bolted to the iron stud.

The internal surface of the iron may be easily preserved by coating with a thick lime wash composed of lime and skim milk, the milk being used in the same way as water in ordinary whitewash. The alkaline properties of lime neutralize the acids produced in the fermentation of the green fodder and prevent its action in corroding the iron. An iron silo coated in this way will, with reasonable care, keep bright and clean and will last for many seasons. The outside should be protected with a coating of tar. The following are some of the advantages of this type of silo:—

Durability.—When protected as above it is practically indestructible. Being made entirely of iron there is no danger from white ants, fire, rotting or warping of timber, &c., and it will also be vermin proof.

Portability.—It can be moved from paddock to paddock by means of horses and dray, the sections when packed making about a two-horse load. Oftentimes it would be a great saving of time and labour for a farmer to move his plant and silo to the crop rather than bring the crop to it.

Future Enlargement.—The silo can be enlarged in diameter or height by simply erecting more sections.

As a storage cylinder for grain or chaff the silo described would be found very suitable.

THE PROCLAIMED PLANTS OF VICTORIA.

(*Continued from page 208.*)

Alfred J. Ewart, D.Sc., Ph.D., F.L.S., Government Botanist; and J. R. Tovey, Herbarium Assistant.

Treacle Mustard.

Erysimum repandum, L. (Cruciferæ).

A tall erect herb; stem much branched at the top; leaves narrow, lance-shaped, with somewhat toothed edges; stem and leaves bearing more or less scattered forked hairs. Flowers yellow, clustered in elongated terminal racemes; stigma seated on the top of the ovary. Pods spreading, hardly thicker than the short stalks; seeds oblong, rust-colored.

A smaller variety exists with a simple unbranched stem, about 6 inches high, but the ordinary form may attain a height of 2 feet or more in good soil. In poor dry soil it may develop as an annual, though under less severe conditions it usually lasts for two years, or even longer if the conditions are very favorable and the formation of seeds not abundant. Strongly flowering and seeding plants usually exhaust themselves and then die, but the seeds are very abundant, and some may remain living in the soil at least three years, and possibly longer.

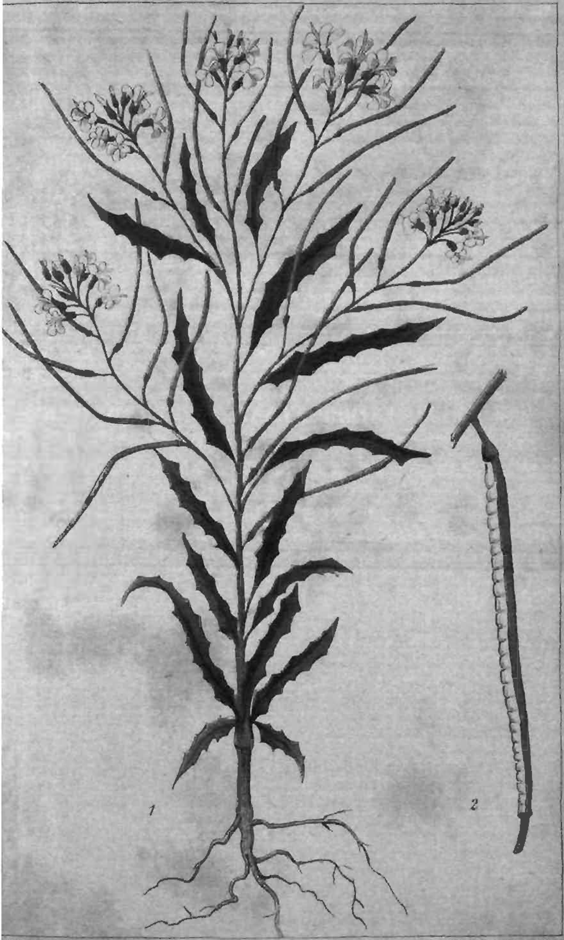
On permanent pastures, cutting and the prevention of flowering and seeding will keep the plant under. In cultivated ground a bare fallow or a crop of potatoes will help to clean the ground, if the seedlings are killed as they appear, and given no chance to establish themselves. Care should be taken that no seed is sown which contains the seeds of this plant. They can be recognised by their oblong shape and reddish color, and are about the size of ordinary mustard seed.

This plant has been wrongly called "Wild Mustard," which name applies to the "Charlock," *Brassica sinapistrum*, Boiss.

It is a native of Southern Europe.

Proclaimed for the Shire of Wimmera, December, 1900.

PLATE 24.



G. Wauer Del. A. J. Ewart Direx. J. Kemp Acting Govt Printer

TREACLE MUSTARD.

(Erysimum repandum, Linné)

1 A complete plant. 2 An enlarged pod

INSECT PESTS IN FOREIGN LANDS.

(*Continued from page 143.*)

FIFTH PROGRESS REPORT BY MR. W. W. FROGGATT, F.L.S., F.E.S.

28th January, 1908.

My last report dealt with my investigations in Mexico. Since then I have been through the West Indies, and am writing this report at sea on my road to London, where we are timed to reach on 10th February. There I propose to see as many of the economic entomologists as I can, and all the collections of economic work, at the same time finding out all I can about the quickest methods of seeing the economic entomologists of Southern Europe who are interested in fruit flies and other pests.

I left Vera Cruz, Mexico, on 28th November, and came round by Progresso on the coast of Yucatan, where we spent a day loading bales of sisal fibre, the chief product of this State. We reached Havana on the 2nd December. As soon as I landed I engaged an interpreter, and, after calling upon the British Consul, presented my credentials to the Minister of Agriculture, who gave me letters to the scientific societies and the Director of the Experiment Station at Santiago des Vegas, to which place (fourteen miles out of town) I went next day.

The Director, Mr. I. F. Crawley, and his staff (all Americans) did everything they could to make my stay profitable, and I spent a good deal of time at this Station. The greater part of this district is red soil over limestone formation, and one of the most profitable industries is growing wrapper leaf tobacco. Nearly all the small holders grow some tobacco, sometimes shaded with banana plants, but more often without; they all cultivate and water by hand. There are, however, a number of large growers who cover the plants with cheese cloth, which protects them from insect pests, breaks the direct rays of the sun, and keeps the soil moist, so that the plants grow more rapidly, and with perfectly shaped leaves. One firm has 30 acres sheltered with cheese cloth on poles and wire about 9 feet in height. The filling tobacco is grown in the ordinary manner. The chief pests of the tobacco planter are the larvæ of the large hawk moths (probably several species), and cut worms. The men employed on the tobacco estates are constantly going over the plants and hand picking the grubs, for even a small hole spoils a wrapper leaf.

A number of citrus orchards have been started during the last few years by American growers, and consist of grape fruit (pomelos), oranges, mandarins, and a few lemons, but three-quarters of the trees grown are grape fruit, which is the fashionable fruit in the United States, and it is now being shipped to England. It is extensively grown in Florida, Cuba, Porto Rico, and Jamaica, and is eaten as a breakfast fruit with sugar. There is a semi-wild species common in the peasants' gardens which has a smooth skin, with a very fine flavor, but is smaller than the cultivated ones. Grape fruit usually brings 4 dollars (16s. 8d.) a case in the New York market. All the citrus fruits in Cuba are badly discolored with melanose or rust mite, and many of the fruits look as if they had been dipped into ink—they are so black—whilst others are rusty red. Several *Lecanid* scales are very abundant and blacken the trees with smut. One very large *Lecanid* scale, which I saw here for the first time, attacks the bark somewhat like "woolly aphis," and damages the bark where it is cracked or

broken. White louse is another common pest, but there is no red or yellow scale in these orchards. The annual rainfall of Cuba is 80 inches, but this last year there has been a drought all over the island, and they have only had about half their usual rainfall, so that the orchards look at their worst. I found no record of fruit flies in the orchards, but one peculiar pest is a bright greenish weevil (*Pachnæus virescens*) which in the larval state feeds upon the outer surface of the roots of the citrus trees where they pupate. When they emerge they climb up into the foliage, where the beetles lay their eggs between the leaves which they gum together, in exactly the same way that the apple root weevil (*Leptops hopei*) does in the Victorian orchards. Where the leaf-cutting ants (*Atta insularis*) are numerous they do an immense amount of damage, stripping every leaf off a tree in a single night; and roses and vegetable gardens suffer as much as orchards.

In the experimental plots I noticed for the first time a native chrysomelid beetle attacking the foliage of eucalyptus trees. Some Cuban cedar trees (*Cedrela odorata*) were so thickly covered with the larvæ of a froghopper (so enveloped in woolly matter that they looked like mealy bugs), that some of them were killed. A number of *Aleurodes* were found upon different trees. On the 12th December I went with Mr. Horn, of the Experimental Station, to the Guines district where there is a very large area under tomatoes, which are grown under irrigation in a heavy black soil. The small holders grow the tomatoes and sell them to the American packers at from 4s. 2d. to 6s. 3d. per bushel at the packing sheds; on arrival at New York and Chicago, they usually bring 16s. 4d. per bushel. The tomatoes are of the stone variety, and are hard and green when packed. Large quantities of cabbages, onions, and green peppers and other vegetables are also grown in this district. The chief disease of the tomato is a fungus that forms discolored black blotches beneath the skin; it is said to be caused by the tomatoes resting upon the ground when the land is irrigated. The tomato packing lasts from December to the end of May. We also visited one of the largest sugar mills in this district, "La Providencia," where they have been growing cane on the same land for over 100 years without any fertilizer. This estate has about 800 caballarias (over 160,000 acres), but only part of it is in cane. The output is 13,000,000 arrobas of sugar (an arroba is 25 lbs.), and the mill is a very large one with modern machinery. The cane-fields were full of long horned grasshoppers, and in the village there were thousands of them flying round the electric lights in the square.

On the 15th December, with letters of introduction to leading planters at Cienfuegos and Santiago de Cuba, I left Havana and reached the town of Cienfuegos, 190 miles south at 6 p.m. Next morning, with an interpreter, I called upon the manager of one of the largest plantations, but found he had left the night before for Santa Clara; his chief clerk arranged to send word to him, and promised that I should get word early next morning. In the meantime I visited a large experimental garden, some six miles out, owned by a wealthy Cuban, Signor Calvado, who grows all kinds of tropical plants and fruits. As I could not get in touch with the manager referred to, I left the following afternoon for Santa Clara, where I stopped the night, and caught the mail train to Santiago de Cuba at 6 a.m., reaching that town at 10 p.m. Next morning I visited the British Consul, who gave me letters to several of the large plantations in the district, but in the meantime the Secretary of the United Fruit Company's "Boston Plantations" called upon me and invited me to go with

him to Banes, about 100 miles north. We left at 6 a.m. next morning, and after changing trains at several junctions reached the plantation at 3.30 p.m.

The United Fruit Company first laid out this country as a banana plantation, but found that it would not grow fruit, so planted it with sugar cane, and now there are 20,000 acres of sugar cane ready to cut, with 60 miles of railways laid through the fields. I travelled all over the estate with the manager, and saw several small plantations of citrus fruit that were very free from pests. While here the British Consul sent me word that the boat to Jamaica was to sail a day earlier than advertised, and that the quarantine between Jamaica and Cuba, on account of yellow fever, had been raised that day. I left at 2 p.m. (22nd) for Santiago, but was delayed seven hours (a common thing on these lines) at Cedro Alto, and did not reach my destination until the following morning.

I left Cuba at 4 p.m. for Kingston, Jamaica, by the s.s. *Oteri*, and arrived there next day at 8 a.m. This was Christmas Eve, and all the officials were out of their offices until the 27th, when I went up to Headquarters House and presented my credentials to the Colonial Secretary (Hon. T. Bourne), who gave me a free pass on the railways, and sent me up to the Hon. I. Faucett, the Director of Botanical Gardens, Forests, &c. At Hope Gardens I obtained a great deal of information, and received letters to a number of different planters. The following day I took the train to Port Antino (79 miles), and next morning drove out to Burlington and called upon the Hon. H. Cork, who showed me round his estate. He had 24 acres of cocoanut palms in full bearing, every one of which was destroyed in the hurricane of 1905 which swept over this side of the island. Cocoanuts are worth 8s. per hundred for shipment, and 11,000 were exported to America last year, while there is a large local consumption. Port Antino is the chief centre of the banana industry. In 1896 there were only 19,227 acres in bananas, but the area in 1905 had increased to 44,325 acres. Last year Jamaica exported 16,000,000 bunches of bananas to the United States and Europe (a bunch consists of from 12 to 9 "hands"—anything smaller is counted as half a bunch). The value of the exported bananas was £880,000. The bulk of these fruits is consumed in the United States. Jamaica also exported 32,000 packages (in barrels or Florida fruit cases) of grape fruit worth 6s. per package, and 55,000 oranges worth 2s. 6d. per hundred. I might here remark that the United Fruit Company practically controls the markets of the United States, and nearly all the fruit in Florida, Cuba, the Central American States, and the West Indies passes through their hands. Mr. Cork informed me that the large banana growers use sulphate of ammonia as a fertilizer, and find it pays them.

On the afternoon of the 28th I left for Bog Walk, the junction for the Ewarton line, and stopped there that night. I left on Monday by the 8 a.m. train, reached Ewarton at 9.30, and took a trap out to Worthy Park, 8 miles over the mountains, and arrived there before lunch. Mr. J. V. Calder gave me a warm welcome, and found me a horse and guide to go through his cacao plantation, one of the largest in the island. At present prices it is a very profitable crop, but the trees are subject to a number of different insect pests and fungus diseases. For the first three years of life, a cacao tree has to be grown under shade and looked after, but when firmly established is a very hardy plant. Many growers say that cacao should always be grown under shade, while others claim that if the trees are properly planted 12 to 18 feet apart, and properly pruned, they

will grow enough shade to protect themselves, and that the planting of shade trees causes the many diseases that attack them. One of the most serious diseases is canker, which attacks the main stem; starting as a diseased postule under the bark, it spreads all round, and if not cut away and treated with a dressing of fish oil and tar, it will very soon kill the tree. Black rot attacks the growing pods, and if they are not cut off it spreads into the stem wood and kills the flower bearing wood. Thrips first appear among the foliage, and then spread down into the growing pods. When numerous they damage the skin and cause the pods to become aborted and the beans inside to perish. The rats also damage a good many pods, and the woodpeckers often bore holes into them and suck out the beans. In Trinidad the leaf cutting ant often does some damage, and two beetles (*Steirastoma depressa* and *S. histronica*) lay their eggs in the bark which the larvæ damage considerably. In addition to rats, squirrels and rat opossums damage the pods.

The cacao industry in the West Indies was valued in 1905-6 at £1,500,000. It is the sole crop of Grenada; in Trinidad it is worth double the sugar output; and it is a large industry in Jamaica, St. Lucia, Dominica and St. Vincent. The average yield in Grenada is 784 lbs. to the acre. Mr. Calder is also planting out a considerable amount of rubber trees, but none of them are of commercial value up to the present. I also visited the sugar mill where about 500 tons of sugar are turned out every year, but nearly all the mills in Jamaica make their profits out of the rum they distil, while the sugar pays their working expenses.

Next morning I came down by train to Spanish Town, and from there took a trap to Hartlands Estate, where Mr. A. Wigens, managing partner, took me all over the citrus orchard of 190 acres. This estate was first planted with bananas, but it was found that they would not do in the heavy black soil, and citrus fruits were substituted. The greater part consists of grape fruit, with some royal oranges (a mandarin with a very coarse skin), navel and other oranges. The whole place is irrigated by gravitation. Here, as in Cuba, melanose is very bad, while white louse (*Chionaspis citri*) and round scale (*Aspidiotus ficus*) are very abundant, often covering the fruit. Canker somewhat similar to collar rot with us, and probably due very often to the same cause, want of drainage, is very common, but is kept under with cutting away the diseased tissue and treating with a mixture of fish oil and tar. Spraying with Paris green and lime, salt and sulphur, is regularly carried on in this orchard. Mr. Wigens ships a good deal of his fruit direct to England.

On New Year's Day I left Hartlands at 10 o'clock and reached Montigo Bay at 6 p.m. This is another banana district, and there are a good many small sugar mills in the district. A very large flat bright red mandarin is grown about Manderville on the road from Hartlands; the skin, however, is very loose, and I was told it would not travel well. This is the only place where I came across this distinct variety. On the following day I left Montigo Bay for Kingston, reaching there that evening, and packed up my luggage to start next morning for Barbados, but my boat did not leave till early on the 4th. After calling at Colon (Panama), Savanilla (Colombia), La Guayra, and Trinidad, we arrived at Barbados on the evening of the 14th. On board the R.M.S.P. *La Plata*, I met the delegates to the Imperial Department Agricultural Conference of West Indies, Messrs. Faucett, Williams, and Savage, and also later on those from Trinidad, Messrs. Hart, Collins, Tripp, and Clarke, who, when we met the Reception Committee, introduced me to Sir Daniel Morris. The

latter, as soon as I had explained my mission, nominated me as an honorary member of the Conference. During the week that the Conference was sitting, I met most of the leading agriculturists and teachers representing nearly every island in the West Indies, and learnt more from them than I would have been able to do in a month otherwise. The chief industry in Barbados, until the last few years, has been sugar, and the island is dotted over with small mills, many of which are worked with windmills. Within the last year several mills have been fitted up with modern machinery, and propose to buy and crush cane on the co-operative plan. In 1906 Barbados exported 50,630 tons of sugar, while the total output of the West Indies and British Guiana was 254,118 tons valued at £2,157,147.

The revival of the cotton industry in the West Indies has been one of the most important events of the last few years, and the total area now under cultivation is over 24,000 acres, chiefly in the islands of St. Vincent, Monserrat, Nevis, Antigua, and Barbados; on the latter, 6,935 acres are under cotton, the value of the crop being estimated at £120,000. In Bridgetown there is a co-operative cotton ginning mill, which was completed last year, and is said to be the largest sea island cotton mill in the world. Sea island cotton is a very profitable crop, bringing up to 2s. 6d. per lb., one lot from St. Vincent realizing as high as 2s. 8d., or 64 cents, per lb. Cotton has a number of enemies, though there is nothing like the American boll weevil in the islands. The most destructive are the two cotton worms (*Aletia argillacea* and *A. lividula*) which attack the foliage. These pests are controlled by the dusting of the foliage with dry Paris green mixed with lime dusted over the plants. The boll worm and the larvæ of two common moths (*Heliothis armiger* and *Laphygma frugiperda*) also damage the bolls. I am, however, told that cotton aphis is one of the worst pests at certain seasons, and as it attacks the under-surface of the leaves is difficult to destroy. A scale insect (*Lecanium nigrum*) at times is very abundant on the twigs, and red maggots, the larvæ of a *Cecidomyia* fly, congregate under the decaying bark of any branchlet attacked by fungus disease. Lately another species of *Cecidomyia* fly has been found depositing her eggs in the flowers of cotton growing at Antigua, and the larvæ are said to feed upon the pollen and cause the flowers to drop.

Montserrat and Dominica are the chief islands where limes are grown for the manufacture of limejuice and citrate of lime, and the value of these products from these islands in 1906 was £62,057. In Montserrat there is a plantation of 2,000 acres; all of these trees are very much infested with scale insects, chiefly white louse (*Chionaspis citri*) and brown olive scale (*Lecanium oleæ*). It is said that the whole of the forest trees is scale infested, and the country is so rough that the trees which interlace overhead cannot be sprayed or fumigated.

I found no evidence of fruit fly in any of the islands, but obtained a report upon the action taken by the Government in Bermuda to deal with the fruit flies in that island. Early last year the Governor passed an Act entitled "The Fruit Fly Destruction Act," which is administered by Mr. T. J. Harris, Director of the Public Gardens of Bermuda, who furnished a report upon the work done up to the middle of August. The Act came into force on 1st March, the Legislature having granted the sum of £500 for the purpose of carrying into effect the recommendation of the Board of Agriculture, namely, "That an attempt be made to eradicate from this island the insect pest known as the Fruit Fly (*Ceratitis capitata*). As

trees are fruiting all the year round in Bermuda, and the flies attack all kinds, first appearing in the loquats in February and March, following into the citrus fruits, peaches, &c., in April and May, and other fruits right into December (winter time in Bermuda), they are very difficult to deal with. The Government undertook the work, purchased tools, and appointed an inspector for each of the nine parishes, with an additional one for Hamilton parish on account of the rugged nature of part of the parish, or, in all, ten inspectors. Trees were pruned back hard, all fruits puntured or fallen were destroyed by collecting them in sacks, weighting them with stones, and throwing them into the sea. When more convenient the fruits were burnt or boiled. It is too early to see the results of this work on the island. but according to this report Mr. Harris claims that there are fewer fruit flies in the orchards than there have been for many years at this season.

In Jamaica, since 1901, fumigation of all incoming plants has been in force under a Proclamation in the Act of 1884, Seeds and Plants Importation Law, which was brought into force to deal with leaf disease of the coffee in Ceylon. At the present time six fumigators are in use at the wharves, Post Office and Government Gardens.

In Trinidad the Legislative Council passed an Ordinance which enables the Governor to declare certain districts infested with leaf cutting ants (*Atta, Cecodoma, cephalotes*) and thus enable planters to take means for their destruction. There is also an Ordinance in Trinidad dealing with the large plague locust that at times does considerable damage in the grass lands. In each large town visited, I have made a point of going through the native fruit markets and seeing and sampling the different kinds of fruits, but propose to write a general report dealing with them on my return.

I also examined all the different insect collections. In Mexico I only found one, made by a local entomologist at Puebla, in the Museum of the University of State. In Havana I went carefully over the very fine collections made by Dr. Gundlach over 50 years ago, and still in good preservation in the Museum attached to the Instituto de Secundo Ensenanza de la Habana. There is also a collection in the Old Belen Church which is one of the largest Catholic colleges in Cuba. I called upon the Father Director, but could not see what the collection contained, as the priest in charge was away. At the Agricultural Experimental Station, through the kindness of Messrs. Horne and Housen, I obtained a fine series of all the economic insects in their collections. At Kingston, Jamaica, I visited the Jamaica Institute where, in the Museum attached to the library, are two cabinets containing a collection of Jamaican insects chiefly gathered together by Messrs. Cockerell and Taylor Townshead when they were Curators of this Musuem.

In consequence of the outbreak of yellow fever in Trinidad, I was unable to land, and did not see Mr. Urich's collections. At Barbados, I went through the economic collections in the Imperial Department of Agriculture, made by Mr. Ballow, and obtained some typical specimens from Mr. Bovell, Superintendent of Agriculture for Barbados, and also had the pleasure of seeing collections of Mr. Edwards at Christchurch, and Mr. Barnes at Codrington College.

STOCK DISEASES.—In Santiago de Vegas, I found that the fowl tick (*Argas Americana*) was very common wherever poultry was kept, and was generally distributed over the island. In Jamaica it is also very common,

and is probably widely distributed over the West Indies, but as there is little or no trade, except for local consumption, nobody appears to take any trouble with their poultry yards.

The cattle tick (*Rhipocephalus annulatus*) is common in Cuba upon both cattle and horses, and any stock feeding upon open pastures are more or less infested with them. As a general rule little attention is paid to them, though Dr. Mayo at the Experimental Station informed me that the Department is going to build several dips after our plans, as on account of the heat of the sun, they find they cannot use the oil smears used so much in the United States. The cattle tick is also found in Jamaica, and there are also a great number of indigenous species found in the different West Indian islands.

Another very serious disease in Cuba is tetanus, which attacks both man and beast. The natives are very careful about their feet when travelling, and, unlike Mexicans, always wear boots or sandals, for injuries to the feet are very liable to bring on lockjaw. It is quite a common thing for a mule if it gets staked in the feet to develop this disease. Dr. Mayo says that rest and treatment with strychnine are the most effective remedies. Thrush in the frog of the forefoot is another troublesome disease in the wet season, and if neglected the hoof rots. Treating with carbolic or creoline and packing the diseased parts cures it in time.

GROWING GREENSTUFF—THREE CROPS A YEAR.

J. S. McFadzean, Dairy Supervisor.

The accompanying illustration of a second crop of maize is from a ¾-acre paddock on Mr. Edmond Fletcher's property at Auburn. The principal business of this place, as carried on by Mr. Fletcher and his two sons, is trading in dairy stock, the cows being purchased as springers and sold when in full profit; and, though this cannot be looked on altogether as dairy-farming, yet there are several items in connexion with the working of the place that bear more or less on the industry. As a general thing about 18 to 20 head of cows weekly are passed through this shed, being purchased by private buyers and Metropolitan dairymen; but orders also come to hand to supply dairy stock for the country districts and the other States, so that at times this number is greatly exceeded. The milking shed is of 18 bails, brick floored and sewered, as are also the stabling and calfpens. The approaches to the stabling and shedding are asphalted over brickwork; and a large store room for feed is similarly floored making it dry and rat-proof. A 2½ h.p. Otto gas engine drives the chaffcutter, putting green-stuff through at a cost of 6d. per week. The feed room adjoins the end of the milking shed; and fodder from the chaffcutter falls directly into the mixing bin.

The cows are handled twice daily to quieten them and for this purpose are in the stalls for about two hours morning and evening; and are then supplied with about 20 to 25 lbs. of mixed fodder each, according to requirements. The usual mixing for the day is about 3½ cwt. of chaffed green stuff, 2 bags of best hay chaff, 2 bags of straw chaff, and 6 bushels of bran, with 10 gallons of water; making altogether about 800 lbs. of feed. Taking this as the general ration given by a practical feeder at a

period when cows have to be well fed, but not fattened or forced, it may be interesting to note that from an analyst's point of view this is rather a "wide" ration; and is just such a food as might be expected to satisfy the animal without inciting any excessive secretion of milk. At the same time the ration is not sufficiently fattening to cause the cow to materially improve in condition, working out at per cow daily:—Dry matter 23 per cent., protein 1.4 per cent., carbohydrates 10.8 per cent., fat .4 per cent., with a nutritive ratio of 1 to 8; or much the same feeding value as would be obtained from a mixture of English grasses—another instance that sound theory and practical methods are closely allied.

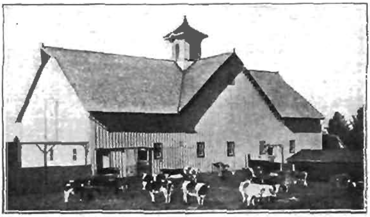
SECOND CROP OF MAIZE—NINE WEEKS' GROWTH.

Situated within five minutes' walk of the Auburn railway station it is not to be expected that much land can be held for growing fodder, still by "intense" cultivation a good supply of green feed is produced the year round. Adjoining the shedding on the north side is the ¾-acre block that is kept for this purpose. It has a surface soil of about 2 feet of sandy loam over a clay subsoil. Mr. Fletcher states that this paddock has been constantly in cultivation for 32 years, and all kinds of root and green fodder crops tried have been successfully raised there. It is usual to make the sowings of green stuff in ¼-acre sections, re-sowing each area as soon as the crop is taken off it. The manure from the milking shed and 5-stall stable—about 3 barrow-loads daily—is stored for use on this

cultivation area; and when necessary the Yan Yean water service is availed of for irrigation. About the end of September last, having taken off a ¼-acre section of green-stuff (black oats), the ground was given a dressing of about 35 cwt. of the shed manure, and 2 bushels of Flat Red maize were broadcasted and ploughed in. The other two sections of the paddock were similarly sown at intervals of about three weeks. A splendid crop of maize resulted—from 8 to 9 feet high. The September sowing was cut out by the 14th January, and re-sown without further manuring. The second section was re-sown about the beginning of February and the third section at the end of that month. Owing to the low state of the water supply this last—the sixth—sowing was left to take its chance, and has made so little headway that the section is to be re-ploughed and sown with oats and peas.

The maize illustrated is part of the January sowing and when photographed was a nine weeks' growth and feathering. Close beside this to the left of the picture is part of the February crop, 6 to 7 feet high at 7 weeks from sowing; and these should come close to record growths for a second crop of maize in one season. At the sowing of each of these two plots the seed was previously steeped in water for 24 hours; and it was showing above the ground within a week. As previously mentioned, about 3½ cwt. of this maize is chaffed daily for the stock; and, as each ¼-acre lasts from four to five weeks, the yield of maize for the season from this ¾-acre block should amount to about 25 tons. A week after the photograph was taken the January sown section was ploughed and sown for early green-stuff with a mixture of 5 lbs. rye, and 3½ lbs. each of oats, barley and peas.

Of course the successful carrying out of this continual cropping is dependent on an unlimited supply of both farmyard manure and water, a combination which unfortunately is beyond the reach of many; still there are many others so situated that for a small outlay they could secure a supply of water, and the manure available would yearly increase as the growing of fodder allowed for more stock being kept. It might be again noted that only under this condition of an unlimited water supply for irrigation can the broadcast system of sowing maize be practised with the sure prospect of a good crop. Where there is any chance of the crop suffering from lack of moisture the sowing in drills and repeated stirring of the soil between the rows with hoe or cultivator is the only sure method of growing this fodder. The failure of the sixth sowing previously referred to is a case in point.



THE IMPROVEMENT OF CEREALS BY SELECTION AND CROSSING.

D. McAlpine, Vegetable Pathologist.

I. Selection.

From the dawn of civilization the cereals have been cultivated to provide the necessary food for the human race, and no other agricultural crop has received such care and attention. Various races of cereals have existed from the earliest times, and even the ancient Romans recognised the necessity for keeping these cultivated races as pure as possible. Thus Virgil in the Georgics (I. 197) writes—"The chosen seed through years and labour improved, was seen to run back, unless yearly man selected by hand the largest and fullest of ears." Selection in this primitive sense was the choice of the best and most representative plants for seed, in order to keep them pure and free from mixture with inferior sorts. The intelligent agriculturalist at the present day selects his seed in this sense to maintain the standard of excellence, but the removal of impurities can hardly be considered as an improvement of the race which it is desired to cultivate.

Selection as applied to the improvement of cereals has only been followed in a methodical way from the early part of the 19th century and, at the present time, there is a widespread movement going on of endeavouring to raise the standard as high as practical skill and scientific knowledge can do it.

We will begin by considering the practice of those who have been successful breeders of cereals and from their practice endeavour to determine the principles which guided them in their work.

Principle of Selection.

Le Couteur was one of the first on his farm in Jersey to carry out the principle of selection in a methodical manner, and he was induced to do this after the visit of a Spanish Professor of Botany, who pointed out to him that the wheats he then cultivated were not really pure and uniform as he thought, but consisted of a mixture of various kinds. In one field of wheat he succeeded in pointing out no less than 23 different sorts, and Le Couteur took the hint and saved the seeds of a single plant from each of these supposed varieties. He cultivated each of these separately and multiplied them, until he obtained sufficient for a comparison of their yielding qualities. The best new varieties were isolated in this way and one of them he put upon the market under the name of "Talavera de Bellevue" about 1830. It is described and illustrated by Vilmorin in his work on the best wheats, *Les meilleurs blés*, as a tall white variety with long and slender white heads, almost awnless and with fine pointed grains. It produces an abundance of good straw and grain and it was chosen on account of its producing the largest amount of the finest and whitest flour. It does not stand cold winters well and is therefore limited in its distribution, but it is still one of the most generally cultivated French wheats and is also grown in England. Le Couteur succeeded, by his method of carefully choosing individual plants and subsequent isolation of the progeny, in producing a variety so pure and uniform that all attempts to improve its peculiar qualities have failed, since it offered no departure from the type sufficient for selection to act upon.

Some time after Le Couteur had begun his work, Patrick Shirreff, in Scotland, followed the same principle but after a somewhat different method. He observed that in his wheat-fields sometimes single plants appeared which looked more promising than the remainder. He saved the ears of such plants separately and sowed the grains and multiplied them in such a way as to prevent admixture with any other sorts. His first success was obtained in 1819 with what he called "Mungoswell's wheat," after the name of the field from which it was taken. The history of this wheat will show his method clearly. In that year he noticed quite accidentally, in a field of wheat, a single plant which was of a deeper green than the others and with a greater number of ears. He chose this plant to begin with and in order to give it the best possible chance to develop to its full extent, he allowed it more space by destroying the surrounding plants, manured it specially, and tended it carefully. The result was that it yielded 63 heads and about 2,500 grains. He sowed all the seed next season by itself in a separate field and gave it plenty of room so as to allow of free branching. The same was repeated with all the seed reaped next year and after two years of this rapid multiplication he was able to place it on the market. He assumed that the original plant from which he obtained it was simply a sport from the variety in which he found it, and that it was the only one. It was regarded as one of the most profitable varieties of Scotland and found its way into England and France.

Following the same principle he afterwards isolated a new variety of oats under the name of "Hopetown oats," another wheat which he called "Hopetown wheat" and finally "Shirreff's oats," which was so prolific as to receive the name from the growers of it of "Make-him rich." Working for a period of nearly 40 years he succeeded in obtaining these four new varieties of wheat and oats. But during this time, from his constant habit of being on the look-out for new and striking forms, he had learned a deal about the variability to which the wheat-plant is subject and he saw that, although exceptional forms were rare, there were a number of less promising forms which might yield good results. Accordingly in 1857 he changed his method of working and made his experiments on a larger scale. Instead of selecting the ears from a solitary plant and from one field, he gathered them from a number of plants in all the fields to which he had access—wherever they showed any marked and striking peculiarity which might be an improvement on the average. In this way he selected 70 ears from different individual plants and sowed the seed from each separately, so that they could be compared among themselves and with the variety from which they were chosen. He ultimately selected the three best; rejecting the others and placed them on the market as "Shirreff's bearded white," "Shirreff's bearded red," and "Pringle's wheat." The first two are still regarded by Vilmorin as among the best wheats of France and "Shirreff's bearded white" has been found to be very productive in Britain. He next turned his attention to oats and four of his selections were of sufficient excellence to be placed on the market. In 1872 he published an account of his experiments and results in a paper entitled *On the Improvement of Cereals*. Latterly, he turned his attention to the crossing of cereals, and this he evidently regarded as a further extension of the principle of having a greater amount of variability to select from.

The principle followed by Le Couteur and Shirreff was distinct and clear. A single initial choice was made and subsequent rapid multiplica-

tion without any further selection or isolation of the best individuals. The race to begin with was pure and uniform and remained so, as long as it was not contaminated with any other variety.

PEDIGREE-CULTURES.

While Shirreff was engaged on his farm in Scotland selecting his best plants as the basis of improvement, another eminent breeder had begun similar work at Brighton in the south of England. Major Hallett started in 1857 from quite a different point of view. He had experience in the breeding of cattle, especially shorthorns, and he applied a similar principle to the breeding of wheats. He went on the principle that each plant has one ear which is the best of all, and that each ear has one best seed, the best seed always being found in the best ear. As he assumed that the qualities of the best seeds are inherited by the plants which they produce, he therefore concluded that varieties would be improved by choosing the ripest and best seed of the best ear of the best plant as a starting point. He repeated this process through a series of generations but he soon found that there was a limit beyond which he could not carry his improvements. This method of selecting each year the best grain from the best ear of the best plant has been called by Hallett "Pedigree-culture." The principle was one which could easily be adopted by every cultivator, at least to the extent of the initial selection, and the results were so striking that it soon became generally and favorably known.

Apart from his initial choice, there are two features which distinguish Hallett's method from the preceding.

The first is that he sought to improve his plants directly by giving them special treatment, such as plenty of space, rich deep soil and manure, and cultivating them with extreme care, so as to increase their productiveness. There is a tradition of his having planted one of his grains, which afterwards turned out one of his best cultures, in a scooped-out potato. He therefore treated his selected plants like garden plants, planting them in the best garden soil and giving them individual care and attention. In this way he increased the number of branches (stooling or tillering) and ears and the number of spikelets and grains in the individual ear. This process of amelioration or improvement was sometimes rapid and sometimes slow. In Hunter's wheat, which was one of the original sorts he selected to be improved, he began with 60 grains in the ear, increased it to 90 in the first year and then during twelve years of culture, the best ear produced 106 grains. In his "Original red wheat" he started from an ear containing 47 grains. In the next generation an ear yielded 79 grains, and in the second generation the richest ear had 90 grains. During the following seventeen generations, the limit was practically not exceeded, as the richest ear never produced more than 91 grains.

The second feature in his work is the amount of care exercised in testing and comparing the plants produced.

The individual plants were chosen and the ears counted with the exact number of grains in each. In this way all the plants above the average were selected and the remainder rejected, and the selected ones again compared so as to secure the very best specimens. In this specimen the ears were again examined and the one best ear chosen for the next generation. If the best individual is chosen, it is not regarded now-a-days as of much consequence which of the grains are sown, so long as they are bright, sound and plump and the smaller grains rejected.

The essential point in these pedigree-cultures is the repeated selection, for in advertising his wheats he distinctly announced "'Bred' upon the same principle of *repeated* selection which has produced our pure races of animals." But if we look more narrowly into the question it will be found that from the very nature of his method he started in each case from a single plant and thereby made a selection from the types in his field just like Le Couteur and Shirreff, and it was this initial choice, not his subsequent selections, which gave the hereditary qualities to his productions. This produced the desired strain and it had simply to be kept pure and reproduced. This is shown, firstly, in the fact that he produced independent varieties, such as Golden Drop Wheat and Chevalier Barley, which have retained their distinctive characters even although their pedigree-culture has long since been discontinued. And secondly that some of his cultures turned out failures, as in the acknowledged case of his "Original red wheat," showing that no amount of subsequent selection could make up for the initial selection if faulty. There is no doubt, however, as to the improvement effected by his methods of culture in the productiveness of his selections, but being acquired during the life-time of the individual he rightly assumed that it had to be continued in order that his pedigree-races might be kept up to their highest point of development, although he confounded this with his continued selection. For general practice, the selected plants should be reared on the same soil and under the same conditions as the ordinary field crops; but any cultivator who will make the right initial selection from a single individual and attend to careful cultivation as Hallett did, should succeed in increasing the yield from this cause alone, so long as the practice is kept up year after year.

IMPROVEMENT OF CEREALS ON A LARGE SCALE.

We will now glance at a modern establishment where the process of selection is carried out on a large scale.

Of all the present day institutions devoted to the improvement of cereals, perhaps that of Svalöf in Sweden is the most instructive example for us and the one from which the most useful and up-to-date information may be obtained. It has been so successful in attaining the objects for which it was established, that a short account of its origin and progress will be given and this account is entirely based on that given by Professor De Vries in his valuable work on *Plant-breeding*. The institution, known as the Swedish Agricultural Experiment Station, exists for the benefit of the farmers of Sweden and the results of the work are accordingly published in the Swedish language.

It took its rise in the little Swedish village of Svalöf, opposite Copenhagen in Denmark, where a company was formed in 1886 for the production and improvement of seed-grains. It was only too evident that the Swedish sorts were deteriorating and required an infusion of new blood, and the aim of this new company was simply to test new and foreign varieties, some of which might be found suitable to replace the inferior kinds. It had a definite object in view, to introduce new and better seed-grains and to see that they were pure before placing them in the hands of the Swedish farmer.

The Company was founded by private agriculturalists and its objects were immediately practical. It did not attempt to educate the farmer nor to carry out purely scientific researches, but in order to succeed in

its aims, it had to follow exact scientific methods. Other organizations were called into existence, principally for dealing with the diseases of cereals, and these carried out researches of a highly scientific nature, because they were necessary for the attainment of practical results.

Although the aims of the Company were not directly educational, yet they exercised an influence on the farmers which had that effect. By the exhibition and distribution of pure seed samples, and particularly by means of their experimental fields where the pure and improved varieties were to be seen growing side by side with the common sorts, the farmers were gradually convinced of the importance of careful seed selection, and when they sowed the pure seed grains themselves with the result of an increased harvest, conviction became a certainty. The Station at first concerned itself principally with the introduction of new and valuable kinds from foreign countries. They purchased and tested the best-known varieties of the cereals, and when found suited to the local conditions, they were multiplied, exhibited, and recommended, and finally given to the trade. The success was so great that another company was started for other parts of Sweden than the south, but after existing for four years, it combined with the original company in 1894, which then took its present name of the Seed-grain Society for Sweden. It associated itself with the local agricultural societies which were so impressed with the results that they gave them financial aid, and even the Swedish Government subsidized them, so that they were enabled to extend their operations. There was thus a commercial as well as an experimental side to the work being done and it was felt that the two could be conveniently separated. Besides, they entered into competition with the local seed-merchants, and in 1891 a separate company was formed for disposing of the improved seed-grains under the name of the General Seed-grain Trading Company of Sweden. It is under the control of the Seed-grain Society and receives its seeds from the experimental fields, so that they are sold under a guarantee of being pure and uniform.

Another point of practical importance must be noted in connexion with the larger field now covered by the Station. It had to provide new and improved races for the different parts of the country and Sweden has not only a wide range of climate but also a great variety of soils. A variety can only be determined as suitable when it is tested under the conditions of soil and climate for which it is intended and no single station could provide the necessary conditions. So while the varieties are produced at the central station, they are sent to other localities to be tested, and such are chosen as are likely to succeed. The local agricultural societies co-operate with the Station in testing varieties and comparing them with the ordinary sorts and considerable improvement has been effected by this means alone. But to meet the want of having varieties directly under their control and of being directly responsible for their purity, they have established two branch stations where the effects and requirements of a different soil and climate can be tested.

Such is the organization of this important Society, and its methods of working to secure its successful results may now be considered. The Society endeavours to cover the whole field of Swedish agriculture, but we will confine ourselves to the means adopted by them of producing improved races of wheat.

At first the methods adopted were such as were prevalent in Germany. A certain number of ears were taken as samples from each of the varieties grown in the experimental field and each sample was sown on a separate

plot in the field, so as to test its quality and purity. The samples chosen from each variety were supposed to be uniform, but it was soon found from practical experience obtained from nearly 1,000 different lots, that there were more or less different types among them. At this stage Dr. Nillson was appointed Director in 1890 and he brought the necessary scientific knowledge to bear upon the practical problems. He saw that the principle on which the selection was made must be somewhere at fault, if the progeny did not agree with the mother-plants from which they were derived. An accidental observation just gave him the clue which was needed. Among the thousands of cultures in the experimental fields, there were a few which bore only one type and their uniform appearance readily marked them out from the surrounding plots. Among the numerous samples selected, there were some common groups represented by a number of ears, and those which were rare had only been met with in a single head. From the perfect system of keeping records, showing the number of ears used in each experiment, it was discovered that just those cultures derived from a single ear were pure and uniform and the conclusion was at once evident that cultures in order to be pure must be started from a *single ear*. This discovery of Nillson threw a new light on the principle of selection but still it was only based on a few examples and required further proof. In selecting samples for next season each ear was kept separate and only two or more were combined when gathered from the same individual plant. In this way over two thousand ears, including wheat and oats, were selected, the grains of each were sown on a separate plot and each group was descended from a single mother-plant. The results amply justified the previous conclusion, for although there were rare exceptions where the progeny was mixed, it could be accounted for by the original selection of hybrids. The selection of single individuals as the only reliable source of purity was thus raised to the rank of an experimentally established fact. From this accidental discovery as it may be called there are some very important deductions to be made. In the first place it shows that repeated selection is unnecessary, for the types were so uniform that further selection was simply impossible—the strain was established. It is the differences which exist in seemingly pure strains which supply the materials for selection, and there were no other differences from the average in each type than such as might arise from plants grown on the outside or in the centre of a field or being accidentally crowded together.

In the second place it shows the sufficiency of one initial choice. The type is isolated from the start, from its being the progeny of a single mother-plant, and only requires to be kept free from accidental admixtures. It might seem at first sight as if the slow method of multiplication might interfere with its practical usefulness, but it was the method of such successful breeders as Le Couteur and Shirreff, and De Vries very pertinently remarks:—"In the beginning it was feared that the reduction of the commencement of a race to one single head might protract its multiplication so as to require more generations to reach the quantity necessary for its ultimate distribution. Experience, however, soon showed this fear to be unfounded, since the elimination of all further selection soon overcomes the incipient deficiency. In reality the multiplication of a separate culture may go on as fast or even faster than that of an old-fashioned methodical selection. All the numerous new sorts which the station has since introduced into the trade are derived each from a single individual." From the farmer's point of view, however, the purity of the strain of the wheat he is cultivating does not count for much unless it has better qualities

and is more prolific than the ordinary sort. But the separate cultures were proved to satisfy all the requirements of the farmer, and he had simply to select the type which suited his soil and conditions. Among the numerous strains all were not equally good but a few were found to be superior in desirable characters. Some were early in maturing and others late, some were able to withstand frost and others had stiff straw, some had excellent stooling qualities and others were distinguished by the size of the ear and the plumpness of the grains. The very best were chosen and tested at the station and multiplied in order to supply the trade. Out of the practical needs of the farmer has arisen this vast organization which aims at covering the whole field of seed selection in a thorough-going manner. It involves the study of the selected individual plants through every stage of their growth, and quite a number of specialists are employed to devote their whole attention to special crops.

Centgener Power.

A new method of individual selection has been adopted recently in America, chiefly by W. M. Hays, of the Minnesota Experiment Station, and also in Germany, based upon the experience of breeders of domestic animals. Hays asserts that half the battle is won by choosing the variety which is to serve as a foundation stock, while the other half depends upon the selection of parent-plants within the chosen variety. On what principle is this selection made? It consists in judging the hereditary value of a plant from the average value of its progeny and not from its visible characteristics. It starts from individual parent-plants as before, but instead of taking their individual yield as an indication of their hereditary value, the average of a hundred grains of their offspring is taken as a standard. Hays adopted this standard of 100 grains for reckoning the value of each parent-plant and hence called it the "centgener power" or breeding-ability. Only those parent-plants are chosen for continuing the race with the largest power in the centgener of offspring and afterwards their seeds are multiplied until the desired quantity is obtained. In this way Hays claims to have obtained varieties of wheat producing 10 to 15 per cent. more grain under the same conditions of culture and treatment than the original variety, and Von Lochow on a similar principle has raised one of the best varieties of rye. This "centgener power" is not only an index of productiveness, but it applies to other important qualities as well, such as ability to resist rust.

Selection Methods at Roseworthy Agricultural College.

There is considerable activity at present in several of the States with regard to the improvement of the cereals, particularly wheat, and they are adopting methods which it is intended should be followed out in continuation of their scheme. It is, therefore, a matter of great importance that the methods of work should be based upon the best available experience, and that a start should be made from the highest level of excellence. We may take as an example the experiments at Roseworthy, South Australia, on the Improvement of Cereals by Professor Perkins. Starting in 1904, he has initiated a course of systematic selection which has the merits of simplicity and continuity. And so successful has he found it during the past four years that he is justified in entertaining the hope that "In the course of time, we shall be in a position to supply the neighbourhood and similarly situated districts with seed of greater value than can in present circumstances be grown by farmers themselves, or purchased on the open market."

Professor Perkins starts from what he calls "*Selection Plots*" in which the grain is grown from specially selected individual ears, say, to the number of 20 or 30. Each head "possesses in the highest degree the special qualities we are looking for" and receives a special index number, under which its salient features are recorded. In each case small and defective grains are carefully graded out, and the balance sown by hand in rows 32 inches apart and a link (about 8 inches) apart in each row.

At harvest-time the strains to be retained are determined and the best ears are selected from these as before, for sowing the *selection plots* of next season. What remains in the selection plots is used for sowing in the *seed plots*, so called because they supply the seed for the ordinary wheat crops of the farm.

There is thus an automatic regularity about Selection Plot and Seed Plot which appeals to one's sense of order and method and the Professor is so satisfied that the selection to be effective must be continuous and uninterrupted, that he even looks forward to the time (not in his lifetime however) when the *100th selection* will be available.

This continuous and uninterrupted selection seems a logical conclusion, in order to maintain the standard of excellence and prevent retrogression, for if the selected plants are simply extremes of fluctuating variabilty, then as soon as selection ceased, there would be a retrogression to mediocrity, as Galton called it, and not constancy to type. This view is forcibly maintained by Perkins when he says :—"We recognize that, as soon as we take our eyes off a wheat we have been endeavouring to improve, as soon as we sell it to somebody else, so soon will it begin falling back with ever-increasing momentum towards the old dead level of mediocrity." This was the principle of Hallett in his pedigree-cultures and the "pedigree cereals" at Roseworthy are based on the idea that the best type of parent has to be selected continuously. But some of Hallett's pedigree cultures such as Golden Drop wheat and Chevalier barley still maintain their place as distinct types, even although they have long since passed out of his hands.

On the other hand the experience gained at the Swedish Agricultural Experiment Station and the practice of Hays at the Minnesota Experiment Station has led to the adoption of the principle of the careful selection of individual plants and the production of a constant race, by simply isolating them, and multiplying the progeny as fast as possible. The point at issue may be tested by retaining the various continuous selections of one variety for comparison, and year after year observing if the earlier selections show a return to "the old dead level of mediocrity." So many of our theories regarding heredity are in the melting pot at present that we require an experimental basis for our practical work. The simple principle of selection followed by us is to choose single mother-plants to begin with and then to judge of their hereditary value not by their visible marks but by the average value of their progeny. The "centgener power" of each is determined and this settles their final selection. This is entirely different from the idea of a pedigree-stock from which the seed necessary for sowing is directly produced and has to be constantly renewed by selection. In the one case the farmer can multiply the seed just as well as the original breeder, while in the other the production of seed is in the hands of the one with the original pedigree and all the profit as well.

The association of characters or correlation as it is called has been specially studied by Professor Perkins and he has been able to show by

exact data, that there is a distinct relationship between grain-yield and average length of head in wheat and barley respectively.

VARIETY TESTING IN VICTORIA.

In Victoria, the testing of varieties has been carried out more or less continuously since 1891, in connection with the Rust in Wheat Experiments. In that year, I had plots of 31 varieties of wheat growing at the Royal Horticultural Gardens, including 12 of Carter's cross-breds from England, and the kind and degree of rust noted in each case. Then in 1892 at the same place, 135 different varieties were sown, the seed of which was obtained from England, France, India, and Cape of Good Hope, America, and the States of New South Wales, Queensland, South Australia, Tasmania, and various parts of Victoria. The main object was to test as many varieties as possible and select desirable wheats for further trial. The results were all tabulated, giving the general characteristics of each variety and the actual yield, together with the degree and kind of rust. Among them all Golden Drop was conspicuous for its rustiness, in spite of 20 different treatments of the seed, and it became a standard variety for testing the remedies proposed for preventing rust.

Then in the next and following seasons, Port Fairy was chosen as an experiment station, on account of its soil and situation being particularly favorable to the development of rust and it was regarded by the late Mr. Farrer as an excellent testing ground for his cross-breds. In the first season there were 333 single seed plots, which were gradually reduced as varieties were discarded. The varieties always included some of Farrer's cross-breds and there were 9 special kinds sent by Vilmorin of Paris, all of which succumbed to the rust. Ten Swedish wheats were also received, and the interesting fact determined that the Yellow rust which prevails in Sweden and England does not exist here. The method is described as follows:—" The plan now adopted is to sow a small quantity of each variety of wheat to be tested, say 50 or 100 grains, in rows 18 inches apart and 6 inches between each plant, thus giving each an area of 2 feet. Then the most promising varieties are selected for next season and sown on a slightly larger scale; and the third season, after a rigorous selection of the best rust-resisting plants, sufficient is sown (say one-fortieth of an acre) to allow of small quantities being distributed in different parts of the State for test purposes and interchanges among the different experiment stations in the other States. I regard the distribution of small samples among leading farmers in the wheat-growing districts, willing to report upon their suitability for particular districts, as an essential part of the scheme. It is the first step towards their adoption (or rejection) by the farming community, who will soon determine their commercial value as to yield and rust-resistance."

A number of farmers applied for samples for experimental purposes and sent in reports. There were also variety tests of wheat in the Mallee, under Departmental supervision, on one-acre plots extending over three years, and Outpost gave an average yield of 17 bush. 54 lbs. Oats and barley were also tested at Port Fairy, and in the Mallee, and of the latter some varieties were obtained from Woburn Experimental Farm, England, of which Hallett's Pedigree, Californian Chevalier, and Chevalier were retained as being prolific in their growth and well-headed.

This work of variety-testing has also been extensively carried out by Mr. Pye at Dookie Agricultural College. For about 20 years he has also

been engaged in the cross-breeding of wheats, in which he has achieved considerable success, experimenting largely in conjunction with the late Mr. Farrer. The work of raising and distributing improved wheat is now being placed on a permanent footing by the Department of Agriculture and selection combined with crossing is being carried out at the four experimental stations to begin with—Dookie, Longerenong, Rutherglen, and Wyuna. Standard varieties will also be grown for seed purposes in what may be called "Stud Plots." It is confidently hoped that by means of well selected varieties suited to the different wheat-growing districts, there may be a perceptible increase in the yield, for it is only by the combination of good methods of cultivation and the best strains of approved varieties, that the present relatively low average can be raised.

ELEMENTARY SPECIES.

The "new breeds" of cereals which have recently been introduced into cultivation as the result of selection may be accounted for in various ways. In some cases a variety may unwittingly have been imported, such as Ward's Prolific, which was brought into this country as a stray grain in some wheat from Egypt. Others are undoubtedly the result of the selection of the best types, such as Squarehead wheat and Chevalier barley, and although it is sometimes stated that such selected types are not permanent, there is one of the earliest selection, such as Talavera, still in existence. And this leads me to explain how by a process of selection new and permanent varieties may be obtained. It has been known for some time that among the ordinary species of plants there are often minor or *elementary species*, and sometimes as many as two hundred constant forms have been distinguished within the limits of a single systematic species.

It was discovered at Svalöf that our agricultural crops are particularly rich in these elementary species. The ordinary varieties of cereals are built up of hundreds of these elementary forms, although hitherto mostly unrecognized, and are quite as constant as the variety itself. These sharply defined types are distinguished from one another by their botanical characters and various properties, so that they afford rich material for selection. These distinct marks have to be carefully studied in the field, particularly in the early stages of growth, and then they have only to be selected once in order to be quite pure and constant. From all these considerations it will be seen that selection can isolate forms which may be an improvement on those already existing and suited for a greater variety of conditions. It was formerly supposed that improvements made by selection alone were temporary and unstable, and that the improvements had to be kept up by continuous selection. This view led some to neglect this means of improvement altogether and confine their attention to crossing as the only way to reach permanent stability. No doubt when additional vigor is required and a greater amount of variability to choose from, then the shock of crossing, after long continued in-breeding, affords the necessary reaction, but selection alone by means of elementary species and by sports may lead to permanent improvement.

(*To be continued.*)

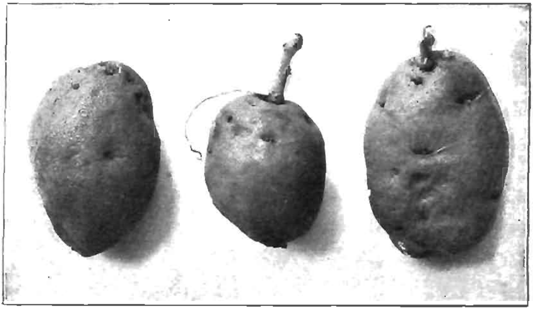
RESULTS OBTAINED FROM IMPORTED VARIETIES OF POTATOES.

George Seymour, Potato Expert.

In an article in the *Journal* for November, 1907, the history of the varieties imported by the Department of Agriculture was briefly dealt with and tables were given showing the results obtained whilst the potatoes were grown by the Department. Over 3½ tons of seed was then distributed in 28lb. parcels to the public at a charge sufficient to cover the cost of packing and freight. About 300 parcels were sent out, followed by 250 circulars asking for certain information, but only 60 replies have been received.

Distribution of Seed.

As some impatience was shown by the public at the delay in the distribution of the seed, it should be stated that there were several reasons to warrant the delay. In the first place there was a danger of introducing the potato disease known as Late Blight, and to have at once distributed the varieties broadcast might have resulted in spreading the disease throughout the State. As it was the distribution was fairly wide, as will be seen from page 649 of the article referred to above, but fortunately there were no evil results. My opinion has always been that any seed potatoes imported into Victoria from any place outside the Commonwealth should



SPROUTING OR BUDDING OF TUBERS IN THE GROUND CAUSED BY HEAT.

be grown for two years under the observation of the Government Entomologist and Government Pathologist as a safeguard against the introduction or spread of any pest or disease. As long as there is uncontrolled importation of potatoes from Europe and America so long will there be a danger of the introduction of Late Blight—the greatest of all scourges of the potato—which has already been introduced into New Zealand. The Victorian Department of Agriculture has realised the seriousness of the situation and is devising means to guard against this contingency. The

second reason, viz., the testing of the cropping and cooking qualities, is a minor matter when compared with the first; for particulars, see page 651 of the *Journal* for November, 1907.

In distributing the varieties the early maturing sorts were, as far as possible, allotted to the early districts near Melbourne and to the northern areas where potatoes are not generally grown, the object being to find an early variety that would develop with the spring rains and mature before the summer set in. The main crop and late sorts were sent to the later districts. The replies to circulars cover widely separated districts extending from Bairnsdale in the east to Warrnambool in the west and from South Gippsland to Rutherglen in the north, so that a good general idea of the value of the varieties will be obtained. One thing brought out in the reports is the poor results obtained in all the districts—attributed in the main to the unusually dry season. Upwards of forty districts reported "a light yield," "partial or total failure," owing to dryness of season; in similar reports received from Geelong, Heatherton, Nagambie, Oakleigh, Rutherglen, Springhurst, and Warrandyte the cause of failure was ascribed to early or late frosts. There is little doubt but that the light crops in the early districts around Melbourne were due to frost followed by continuous drying winds which in some cases carried away several inches of the soil.

PROFUSE GROWTH AND NO TUBERS.

Many complaints regarding a profuse growth of haulm and no tubers have come to hand. Inquiries as to what should be done to make the plants tuber have accompanied the complaints. Some have suggested mowing off the haulm, but it is difficult to see how depriving the plant of its leaves would produce tubers. This condition is brought about by favorable weather conditions during the growth of the plant followed by dry weather and consequent stoppage in the flow of sap when tubers should be forming. If the tops are cut off and favorable weather should follow, the first thing the mutilated plant will do will be to set up a new growth of leaves.

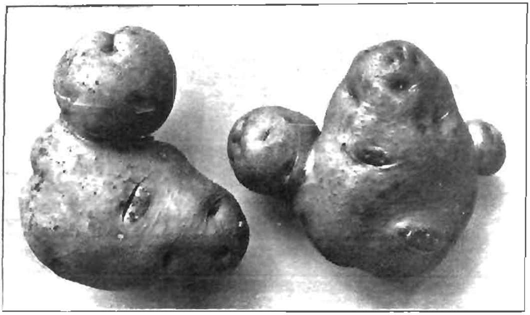
EFFECT OF HEAVY FALL OF RAIN.

Many reports to hand show that the heavy rain on 26th December did much harm to the crop by setting up what is termed "second growth." This is really a first growth, for if the tubers are examined it will be found that the heat has caused the tubers to send out a shoot, generally at the crown or rose end (see illustration on page 292). Rain at this stage, coupled with heat, frequently causes a string of tubers to form. Varieties that are produced by bud variation are more prone to this growth than those raised from seeds. True second growth is caused by rain setting up a new growth of the plant which sends a fresh supply of sap into a tuber which has ceased growing. If the tubers are not too firm the food finds its way along the channels to the eyes and produces a prong or horn (see illustrations 2 and 3), which sometimes exceeds the original in size and feeds on it leaving the original tuber a withered mass (see plate No. 4).

THE VARIETIES.

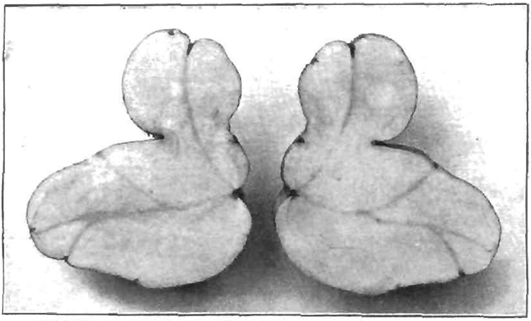
The varieties reported on most favorably are Warrior, Factor, Up-to-Date, Scottish, Triumph, and Duchess of Buccleuch. These are the sorts which have been the most consistent croppers through all the tests. An exception has to be noted in the case of General Kitchener which, in most of the previous tests, gave poor results. This potato is classed in Great

Britain as a second early, and is reported to be "a robust grower and an immense cropper." Some very good specimens were forwarded by Mr. Stone, of Mordialloc.



SECOND GROWTH CAUSED BY FRESH SUPPLY OF SAP.
(The plants usually show a new growth of leaves.)

Northern Star, with one exception, is spoken of as a failure. King Edward VII. is favorably mentioned at two stations, viz., Drouin and Yarra Glen. British Queen has done well at a few stations, one report describing it as "a first-class early"; but as a rule it produces too many small ones and has been marked "a failure" at a number of places.

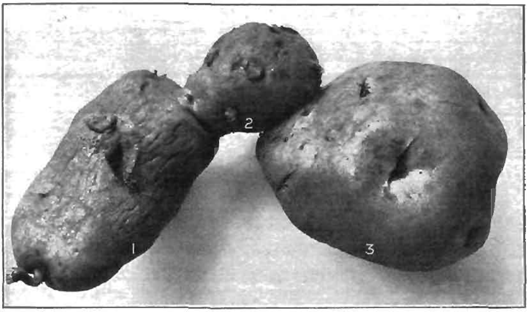


INTERIOR OF TUBER SHOWING LINES ALONG WHICH SAP FLOWS.

Warrior was reported on from Vermont as having "turned out a splendid lot of good, useful sized tubers," and at Beaconsfield as a "grand potato for general crop." This variety has much to recommend it as a main crop

potato, being of a robust habit, producing a good even run of tubers; its flesh is white and it is a good cooker.

The variety which gave the most consistent return was Bismark, which does well on a medium quality land and responds well to manure. It promises to be a good sort for early planting in northern districts, and has been found to mature in twelve to thirteen weeks. The flesh is very white, flavor medium, rather close when cooked. Plants are of a robust habit and throw very few small tubers. Another early variety of promise is one grown under the name of Fox's Seedling. This potato, I believe, is identical with the white Beauty of Hebron. It is a very free cropper, has fine kidney shaped tubers, and is a splendid cooker, flesh white and mealy and of good flavor. The tubers of this variety intended for seed should receive special attention, as they are liable to miss when cut. They should



SECOND AND THIRD GROWTHS OF TUBER.

1. Original tuber wilted. 2. Second growth. 3. Third growth exceeding in weight the original tuber.

not be put away in bags or boxes or stored in a heap, but spread out in an open place where they will be exposed to the light as much as possible so that they will become quite green.

Preparation of Land.

The reports show that great care was taken to obtain the best possible results by the selection of the most suitable soils and by careful preparation of the land and attention to the growing crop; also by the liberal use of farmyard and artificial manures.

In some instances the rainfall registered during the growing period has been supplied; this is very useful information, as it sometimes points to the cause of failure or damage to a crop of potatoes.

Methods of Manuring.

Much attention was given to the methods of applying manures, as the following extracts show:—

"Good deep sandy loam containing a good amount of decayed vegetable matter. When planting I placed stable manure in the trenches with the potatoes. Crop light."

"The soil was light peaty loam, ploughed four times after crop of maize. After tillage consisted of hand hoeing. Manure 4 cwt. superphosphate per acre. Crop light."

"I dug in a good deal of stable manure with them; I think it made the ground too open. Crop a failure."

"The potatoes were a failure, owing, I think, to manuring the ground too heavily. The tops were thick and heavy. Tubers nearly all small."

"Complete failure, although I planted the seed very carefully, putting bonedust and superphosphate on each set to see which would give the best results."

There is much difference of opinion as to the best mode of applying farmyard and artificial manures to the land. Some prefer the practice generally adopted in Great Britain of applying the manure in the drills when planting the potatoes; others choose the autumn or end of the winter, when it is ploughed under, allowing it to combine with the soil during the preparation of the land for planting. The application of well-rotted manure in the drills may give satisfactory results in average seasons, but it very often happens that what is termed farmyard manure is merely rotten or partly decayed strawy matter, which, under the influence of hot weather, becomes so much chaff.

In some seasons the tubers are liable to crack in the centre and become hollow inside. In cases like this the condition is aggravated where strawy matter has been applied. In dry seasons it keeps the soil open and allows the moisture to evaporate. This is confirmed by two of the above reports. With artificial manure some growers apply it in the drills when planting, and obtain satisfactory results, others broadcast before planting, and some after planting. More satisfactory results are likely to follow broadcasting before planting, or better still, when the fertilizer drill is used. To apply manure to freshly cut seed, or to place large quantities of it near the sets, whether cut or whole, is injurious.

RESULTS OBTAINED IN VARIOUS LOCALITIES.

Name of Variety.	Moderate to light Yields owing to dry Season.	Total Failure.	Damaged by Frost.	Damaged by Second Growth.
Bismark ..	Balnarring, Beeac,† Bunyip, Campbell's Creek,† Drysdale,* Elphinstone, Kyneton,† Leopold,* Longwood, Maryborough, Milawa, Rosedale,* Sale, Sorrento, *Warrandyte	Bacchus Marsh, Balmattum, Geelong, Mooroopna, Sale	Elphinstone, Geelong (2), Heatherton, Nagambie, Oakleigh, Springhurst	Drysdale
British Queen ..	Balmattum, Beaconsfield, Beeac, Birregurra, Campbell's Creek, Doncaster, Elphinstone, Gembrook,* Kyneton, Maryborough, Milawa, Nyora,* Pirron Yalloak, Rosedale,* Rutherglen, Sandringham, Sorrento, Vermont, Warrandyte, Warrnambool South, Yarra Glen	Bacchus Marsh, Balnarring, Barry's Reef, Beeac, Coleraine	Flemington, Geelong, Heatherton, Nagambie, Oakleigh	

Results obtained in various Localities—*continued.*

Name of Variety.	Moderate to light Yields owing to dry Season.	Total Failure.	Damaged by Frost.	Damaged by Second Growth.
Twentieth Century	Balmattum, Beaconsfield,* Beeac, Birregurra, Darnum,* Doncaster, Elphinstone, Gembrook,* Koo-wee-rup, Leopold, Lucknow, Maryborough, Milawa, Pirron Yalloak, Rosedale, Sale, Vermont, Yarra Glen	Barry's Reef, Beeac, Coleraine, Geelong	Geelong, Heatherton, Nagambie, Oakleigh	Leongatha, Monbulk
Duchess of Buccleuch	Beaconsfield,* Darnum,† Koo-wee-rup, Nyora,* Sale, *Warrnambool South	Beeac ..	Springhurst ..	Beaconsfield, Leongatha
Empress Queen	Croydon,† Gembrook, Wandin	Barry's Reef, Bunyip, Mooroopna, Ondit	Springhurst ..	Leongatha, Yea
Clark's Main Crop	Darnum,† Meeniyan,* Warrandyte	Bunyip ..	.. ..	Leongatha
Early Puritan ..	Bairnsdale, Rutherglen ..	Geelong, Mooroopna, Sale	Flemington	
Northern Star ..	Leopold, Meeniyan, Ondit, Wandin	Bairnsdale, Bunyip, Mooroopna (2)	Springhurst ..	Drysdale
Duke of York ..	Rutherglen, Sandringham, Warrandyte, Yarra Glen	Bacchus Marsh ..	Geelong, Oakleigh	
Warrior ..	Beaconsfield,* Pirron Yalloak, *Vermont	Coleraine ..	.. ..	Beaconsfield
Up-to-date ..	Birregurra, Doncaster			
Carman No. 1 ..	Longwood			
General Kitchener	.. ..	Bairnsdale, Mooroopna	.. ..	Drysdale
Duke of Rothesay	Croydon,† Sandringham, Yarra Glen	Bairnsdale, Ondit		
King Edward VII.	Bairnsdale, Lucknow, Rosedale, *Sorrento	Balnarring, Barry's Reef	.. ..	Beaconsfield, Monbulk
Evergood ..	Beeac, Doncaster, Elphinstone, Maryborough, Meeniyan	Balnarring, Beeac, Mooroopna		
Royal Kidney ..	Sandringham	.. ..	Flemington	
Goodfellow ..	Koo-wee-rup	Bacchus Marsh ..	Flemington ..	Monbulk
Scottish Triumph	Birregurra, Darnum,† Koo-wee-rup, Meeniyan,* Nyora,* Wandin, Warrnambool South	Mooroopna		
Factor ..	Gembrook, Heatherton,† Lucknow, Oakleigh,* Sale, *Sorrento	.. ..	Nagambie, Yea	Monbulk
Dunion ..	Croydon,† Lucknow, Milawa, Pirron Yalloak, Wandin Warrnambool South	Beeac, Ondit		
Black Prince ..	.. ..	.. ..	Yea	
Copperskin ..	.. .. ..	.. ..	Yea	
Table Talk ..	†Heatherton	Coleraine ..		

* Moderate yield. † Satisfactory return for the season.

Artificial Manures Acts.

SUPPLEMENTARY LIST OF UNIT VALUES OF MANURES IN THE MELBOURNE MARKET DURING THE 1908 SEASON.

Description of Manure.	Potash.		Estimated Total Value of Manure per Ton.	Price asked for Manure per ton delivered at Local Railway Station.	Where obtainable.
	Percentage.	Estimated Value in One Ton of the Manure.			
Mainly Potassic.		£ s. d.	£ s. d.	£ s. d.	
Potash Chloride	60·72	16 14 0	16 14 0	13 12 6	Colonial Manures Coy., Melbourne
Potash Sulphate	52·46	14 8 6	14 8 6	13 17 6	" " " "

Description of Manure.	Moisture.	Nitrogen.		Phosphoric Acid.								Estimated Total Value of Manure per ton.	Price asked for Manure per ton. Delivered at Local Railway Station.	Where Obtainable.
				Water Soluble.		Citrate Soluble.		Insoluble.		Total.				
	Percentage.	Percentage.	Estimated value in One ton of the Manure.	Percentage.	Estimated Value in One ton of the Manure.	Percentage.	Estimated Value in One ton of the Manure.	Percentage.	Estimated Value in One ton of the Manure.	Percentage.	Estimated Value in One ton of the Manure.			
Mainly Phosphoric, Phosphoric Acid readily soluble.			£ s. d.		£ s. d.		£ s. d.		£ s. d.		£ s. d.	£ s. d.	£ s. d.	
Superphosphate ..	10.84	..	..	17.97	4 5 4	1.34	0 5 1	3.73	0 3 9	23.04	4 14 5	4 14 5	4 7 6	J. Kitchen and Sons, Ld., Melbourne
Containing Nitrogen also.														
Nitro-Superphosphate ..	6.79	1.66	0 17 10	13.30	3 3 2	2.62	0 10 6	5.35	0 5 4	21.27	3 19 0	4 16 10	5 0 0	" " " "

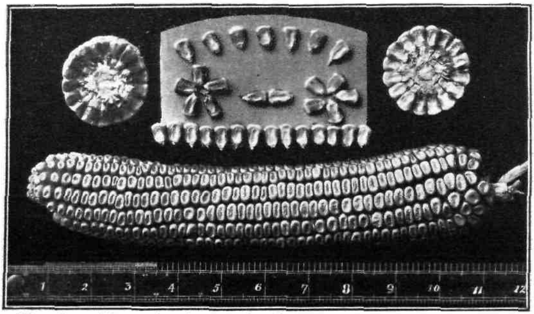
SUPPLEMENTARY LIST OF UNIT VALUES OF MANURES IN THE MELBOURNE MARKET DURING THE 1908 SEASON—*continued*

Description of Manure.	Moisture.	Nitrogen.		Phosphoric Acid.		Mechanical Condition.						Estimated Total Value of Manure per ton.	Price asked for Manure per ton. Delivered at the Local Railway Station.	Where Obtainable.
								Nitrogen.		Phosphoric Acid.				
	Percentage.	Percentage.	Estimated Value in One ton of the Manure.	Percentage.	Estimated Value in One ton of the Manure.	Percentage of Fine Bone.	Percentage of Coarse Bone.	Percentage in Fine Bone.	Percentage in Coarse Bone.	Percentage in Fine Bone.	Percentage in Coarse Bone.			
			£ s. d.		£ s. d.							£ s. d.	£ s. d.	
Containing Phosphoric Acid and Nitrogen. Phosphoric Acid difficultly soluble.														
Fertilizer No. 2	5.55	6.20	3 5 10	11.99	2 4 7	44.50	55.50	2.76	3.44	5.32	6.67	5 10 5	5 15 0	Thos. Borthwick and Sons, Ld., Portland
Bonedust and Blood	11.80	4.50	2 4 1	18.00	3 4 1	11.70	88.30	0.54	3.96	2.16	15.84	5 8 2	5 10 0	Edwd. Lloyd, Box Hill
Bonedust	3.38	2.40	1 5 2	25.45	4 14 0	39.00	61.00	0.94	1.46	9.93	15.52	5 19 2	6 0 0	A. A. Turner, Ballarat East
"	6.07	3.44	1 16 1	19.24	3 11 6	42.80	57.20	1.47	1.97	8.27	10.97	5 7 7	5 0 0	A. J. Burge, St. Arnaud
Echuca Bonedust	5.77	3.58	1 18 3	18.20	3 0 8	46.80	53.20	1.68	1.90	7.60	8.60	4 18 9	5 10 0	Boyle, Williams, and Henderson, Echuca

W. PERCY WILKINSON,
Acting Chemist for Agriculture.

Government Laboratory,
Melbourne, 4th April, 1908

PRIZE MAIZE COBS.



The above illustration is reproduced from a photograph of one of the prize maize cobs recently exhibited at the Orbost show. The variety is "Sibley." There are about 50 grains in each row, or a total of 700 on the cob. It will be noticed in the cross section that the size of the core is comparatively small, the length of the grain constituting a large proportion of the cob. In order to grow cobs of this character it is necessary that the plants should grow vigorously on rich land, and there should not be more than about 3 stems to the square yard or 15,000 to the acre. The phenomenal yields which are obtained in Eastern Gippsland are partly due to the rich river flats on which the maize is grown, but also, and to a very large extent, to the fact that the summer rains come at the period that the plant requires them. Careful preparation of the seed bed and systematic inter-tillage between the rows are, however, capable to a very large extent of neutralizing the effects of a dry summer. The dried grains on the above cob weighed 10½ ounces.

TREATMENT OF LAMBING EWES.

H. W. Ham, Sheep Expert.

During the month of May, merino and fine comeback ewes are lambing in full swing over the greater portion of the State, and where feed is scanty, or of poor quality, there is sure to be trouble in many forms. Where ewes leave their lambs, the main cause is low condition. Breeders who have watched this matter closely observe that ewes, when lambing in good order, and in a season when grass is fresh and plentiful, have very full udders of milk. This fullness of milk is one of the chief calls of nature, for observant shepherds have seen ewes repeatedly stand over and assist lambs to get to the udder, especially so when very flush. On the other hand, when ewes lamb in low condition and are hungry, there is very little milk pressure, and they show little or no regard for their lamb. Maiden ewes give proportionately more trouble in this respect, mainly from the severe time they undergo in lambing. Many maiden ewes appear dazed

and stupid immediately after lambing, and move off at once. Especially is this the case if they have been mated with unshapely rams, the worst class to cause these troubles being the sloping shouldered ones; with these the point of the shoulder stands out, and they always have a high wither and a long weak neck, with the head above the average in size. At the same time, whatever class of rams is used there will always be a few ewes that will give trouble and die in lambing.

Again, four and five year old merino ewes that have had two and three lambs to merino rams will give trouble, if joined to any of the British breeds that are coarse boned and rough in shape. They appear to become set to merino lamb size. If the merino ewes mentioned were reared in a wet climate on natural pasture, they would not grow as lambs, and, up to two-tooths, like our northern bred ewes do. If, in addition to this, they were not far descended from some of our large framed merinoes, they would, with the rough rams mentioned, have an hereditary tendency to throw larger lambs than their size warranted. This is the main reason why some beginners in breeding cross-breds have more than their share of losses. A ewe stunted as a lamb never develops for breeding purposes like one well reared.

There are breeds of bad mothers, more in merinoes than in British breeds. Stud sires of a wild, restless disposition assist towards bad mothers in the flocks, but more fault lies with the want of better thriving abilities. In the case of stud merino ewes, and some of the most woolly flock ewes, there is such a growth of wool about the udder and thighs that often a lamb is hours before he can drop on the teat, and sucks away at yolky locks that hang about these parts. The result is that if the lamb has arrived in wet and cold weather he dies from cold and starvation through no fault of the ewe or the lamb. At times, through carelessness and rough shearing, ewes' teats are cut off and close up. Nothing can be done in cases like this, except to earmark the ewe when found, as a cast ewe. Very special stud ewes could be closely watched at lambing time and the lambs put on foster mothers.

A good plan with stud ewes is to arrange one day a fortnight on which to pick out all ewes showing a few weeks from lambing. Place them carefully down on their side in the usual way, but instead of grasping the flank take hold a little further back on the thigh. When in that position keep the head held up, with the left leg, and shear all wool closely from the front and inside of the thighs and around the udder. This wool can be thrown in a bag and saved; it is lost in most cases as the ewes strip it naturally a few weeks after lambing. This clearing of wool from about the udder and thighs brings about nearly the same conditions that exist in crossbreds. With crossbreds the best percentages of lambs are recorded. When left to lamb without close attention, the clean faced and bare legged class of sheep, all other things being equal, gives the best percentage.

Merino ewes should have the wool cut from their eyes before lambing as they will see the lamb better and will be less nervous. When sheep are wool blind they cannot thrive, for, apart from the restriction of sight, they become very timid.

The more woolly the sheep the more trouble there is with fly-blow, especially in stud weaners if wormy or otherwise unhealthy. The tail parts of lambs or young ewes are never shorn by shearers if the least bit dirty or wrinkly; on the other hand, crossbreds bred well on to the Leicester type are the least subject, being the most bare about the hind parts and with no tendency to folds there. In lambing ewes, if at all woolly from the udder

to the tail (and many of our merino flocks can now be found cutting good combing pieces from these parts), the drainage after lambing collects and drains into this wool, attracting the fly by the smell, and providing a home for the maggots, which afterwards seem to create enough moisture to maintain themselves and attract others, and to extend in some cases right along the back. Some seasons ewes do not clean so freely as in other seasons, and when this is the case there is most trouble. Crutching ewes a month or six weeks before lambing is a good plan, but of course entails a deal of work and expense, and there is also a certain amount of danger to the ewes if roughly handled. If this wool is cut away clear, there is then nothing to detain the drainage, and attract the fly.

Powder dips at the strength used for ordinary parasites are not strong enough, as they do not stop the fly from blowing. They may retard the growth and spread of the maggots, but to such a small extent as to be hardly worth considering. When made stronger and applied direct they certainly stop the young maggots from growing and spreading, and this allows time to get round and clear them before much damage is done. The trouble is that as the wool grows the preparation is carried with it and in a few weeks there is new wool next the skin that allows of retention of moisture and for the maggots to live and thrive and spread in it. What is wanted is something that will keep soluble and, as the wool grows, will spread towards the skin and yet not affect the growth of the wool. The folds in stud weaner ewes that help to stop the free escape of urine, &c., can, with some of the powder dips, be removed in a few applications, details of which will be given later on.

Flies are most prevalent in late spring and early autumn, in moist warm weather, and in timbered country. There are cycles of seasons favorable to them. To keep the sheep healthy, and to remove any attraction for the fly is the first consideration, but if the maggots are there, nothing equals white spirits of tar for speedy killing and for searching qualities, and at the same time the growth of the wool will not be affected; but it is very little service as a preventive. For economy, the best method is to use a scent bottle and shake the spirits of tar on the affected part, or a pint bottle, (if a lot of ewes are to be treated), with a hole cut in the cork. This will allow only a little fluid to escape at a time. With some stud breeders the custom is to lamb the ewes in a small paddock, and as each ewe lambs, cut away the wool from about the tail and let the ewe and lambs into the paddock where the lambs are to be reared. Where foxes are bad the lambs are tarred over the back of the head and neck and a dab is also placed on the hips at the same time.

All the methods mentioned necessitate work, and the ewes being yarded. Many who still adhere to the old custom and belief that in-lamb and lambing ewes should not be disturbed but should be left severely alone, will doubtless raise an objection to this statement. Unnecessary knocking about and rough dogging and ringing are certainly harmful, but the other extreme of leaving them to themselves is out of the question with merino sheep bred to the standard of our best flocks of to-day. Unless a dog is well under control when with lambing ewes he is best left at home, but a good dog is helpful. A ewe will often stand and stamp her foot at the dog until a man runs up and catches her. A careful man and a good dog among stud ewes are invaluable; on the other hand, nothing is worse than a reckless, bad-tempered shepherd and a bad dog. Ewes are quieter and better if they are accustomed to being gone through and rounded up at frequent intervals

during the year. When yarding, and letting out of the yards, many men are not careful to avoid crushing in gateways, and much harm is the result.

The use of a veterinary syringe, immediately after special ewes have lambed, or where lambs have been taken away by force, is not common, but no stud sheep man should be without a small one and lysol. British breeds, especially Shropshires, when very fat as they usually are, will go off very quickly with fever unless this precaution is taken.

GARDEN NOTES.

J. Cronin, Principal, School of Horticulture, Burnley.

The Sunflower

Helianthus—The Sunflower—is a genus containing about fifty species of annual and perennial herbaceous plants, the whole of which are found native in America, the majority occurring in North America. Most of the species and their varieties are tall growing plants, producing large flowers yellow in color in their ray florets, the disc florets varying in the different varieties. The annual kinds are well known and popular garden plants of easy culture and ornamental value; among them are many improved forms, of which the miniature sunflowers are possibly of most value, producing as they do quantities of flowers of moderate or small size that are very effective in the garden beds and useful for decorative purposes as cut flowers. Among the perennial kinds are many that are worthy of cultivation in any garden, the later raised florists' varieties being especially fine. Double and single forms exist in both the annual and perennial types, and although the colour of the flowers is uniformly yellow there is a deal of variation in the different groups or varieties.

The common sunflower (*Helianthus annuus*) is a plant of considerable economic importance and is largely cultivated in Europe, Asia, and America for its seeds. According to *The Agricultural Ledger*, 1907, *No.* 1, an area of 216,000 acres is devoted to sunflower culture in Europe alone, the average return being roundly stated at about 50 bushels of seeds per acre. In Russia where the sunflower is most extensively cultivated the seeds are eaten, raw or cooked, or used for the extraction of oil which is said to be excellent for table use, and may be substituted for salad or olive oil for all domestic purposes. The seeds are also of considerable value as food for birds, and are largely used in America for fattening poultry. The oil cake which remains after expression of the oil forms a valuable cattle food, being of great nutritive value and easily digested, while the leaves and stalks also possess highly nutritious properties.

From data derived from experiments and analyses of the plant it is evident that the sunflower requires a fertile soil, and that during cultivation it is also necessary to maintain the fertility of the soil upon which the plant makes considerable drain. The large specimen photographed was taken from a plot grown by Mr. C. H. Schultz of Epping, who grows about a quarter of an acre of sunflowers every year for his fowls. Mr. M. Comans of the Dairy Supervision Branch, who supplied the specimen, states that the plants were grown in light black soil, unmanured. The seed was sown about the end of September, the ground having been fallowed about three months previously.

Soil and Culture.

Any fair garden soil is suitable, if well and deeply worked and manured. Although the sunflower is a plant that will thrive fairly in poor soils, and with a limited supply of moisture, it is found that a moderate supply of manure and either good cultivation, to conserve moisture, or irrigation, is necessary to obtain maximum results. The soil for the reception of the annual kinds should be prepared some time prior to the season for sowing seeds in spring. September is the most suitable month for such sowing, early or late, according to liability to frost. The soil should be finely broken and divided before sowing and the seeds sown at a depth of about two inches. The tall varieties are suitable for growing in masses at the back of large borders, while the miniature

"SILVER QUEEN." ANNUAL.

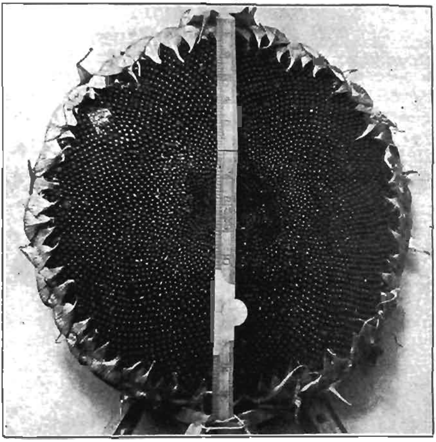
kinds should be allotted positions suited to their height—about two feet. Seeds of the miniature sunflowers may be sown in clumps, allowing six inches for each plant, but the larger varieties should receive much more room—one foot between the plants at least.

The herbaceous kinds are propagated from divisions of the old plants and from seeds. Seeds should be sown in spring and the young plants be set out as soon as ready to handle, to insure a fair season of growth before the blooming season. Divisions should also be planted in spring, the plants blooming so late into autumn that dividing at that time can only be done at the expense of the crop of flowers. Established plants should be divided and replanted into fresh soil in alternate years; if allowed to remain longer, the shoots become crowded and small and the blooms in-

ferior. Varieties and kinds worthy of cultivation are:—Perennials: *multiflorous, Soleil D'Or, multiflorous maxima, rigidus, Childsii, Maximilliana*, mollis, and Miss Mellish. Annuals: Orion, miniature (single and double), Stella, Silver Queen, globosus fistulosus, Henry Wilde, and large Russian, the latter being the best for the production of seeds for poultry, &c.

Flower Garden.

Under normal weather conditions the work of preparing the soil for the reception of various kinds of plants is usually well advanced before May in most gardens, but this year the continued dry and warm weather has caused delay, and it is advisable to carry out the work as soon as



"LARGE RUSSIAN," ANNUAL.

possible. Planting has also been deferred on account of the need of regular watering, if performed, and this work should also be hastened so that the plants may be settled in their new positions before cold weather arrives.

The work of cleaning, manuring, and digging beds is essentially a winter performance, and where a deal of such work must be done, or where the performance becomes a difficult one on account of the nature of the soil and climate an early start with such work is advantageous. Herbaceous plants that have finished blooming, such as phlox, delphinium, and others should be relieved of their dead or dying flower stalks. If it is intended that they shall remain undisturbed for another season a dressing of manure should be carefully forked into the soil around them.

Tree or perpetual carnations will now be producing flowering shoots that require to be staked as they develop. This class of carnation is possibly the most estimable of winter blooming plants and requires little beyond staking, and thinning if crowded, to produce quantities of flowers during the dull winter months. Some varieties are very liable to rust, a fungoid disease that appears on the leaves in the form of brown pustules, which contain the reproductive spores of the disease. Affected leaves should be gathered and burned, and the plants either dusted with lime while moist with dew, or sprayed with a solution of sulphide of potassium—1 oz. to 3 gallons water. Soot is a valuable aid to carnations and should be lightly worked into the soil about the plants.

Seeds of sweet peas may be sown. There is no annual plant so popular at present, and the popularity is well merited. Many of the newer varieties are a distinct improvement on the older kinds and as the seeds can be obtained cheaply, they will probably be grown to the exclusion of the latter. The soil for sweet peas should be well worked and enriched, and sufficient room allowed for the full development of each plant.

Bulbs of many spring and summer blooming plants may be planted. Most kinds are injured by the addition of stable manure to the soil, a light dressing of superphosphate and bone dust, equal parts, being preferable where the soil is deficient in fertility. In many cases fertilisers are applied in such quantities that, even if no injury is done to the plants, at least good manure is wasted. The manure should be finely crushed and dry and be evenly distributed over the surface and lightly worked into the soil. Two ounces to five square yards represent about one cwt. per acre.

Kitchen Garden.

The dry weather during March and April, in addition to checking free growth in the crops sown or planted, provided conditions suited to the increase of cabbage aphis, red spider, and other insect enemies of the gardener. In many cases it is scarcely possible that the plants will survive and produce satisfactory crops. The proper course under the circumstances is to dig the affected plants well under, or pull them up and burn them, and sow seeds of other vegetables. A good dressing of lime is of great value in destroying insects and their eggs, and is a positive necessity towards fertility. Half a ton to one ton per acre (a quarter to a half pound per square yard) of slaked lime is found to be a satisfactory dressing. Broad beans or peas, carrots, parsnips, or onions may be sown instead of the affected cabbages and cauliflowers, and the manure utilised. If clean plants are available a fresh planting of cabbages and cauliflowers may be made; it is unlikely that they will be affected to a serious degree at this season.

Young growing crops should be thinned and freed from weeds, early attention in this direction contributing largely to the probability of a satisfactory return.

FARM REPORTS.

QUARTER ENDED 31st MARCH, 1908.

Rutherglen Viticultural College.

G. H. Adcock, F.L.S., Principal.

VINEYARD.

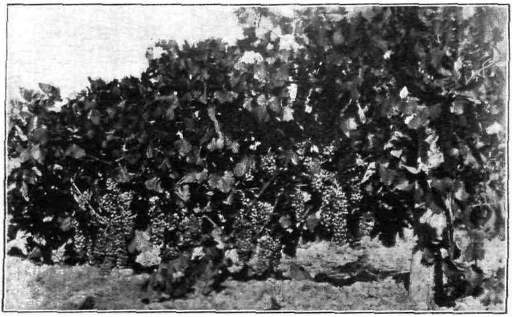
During the quarter the work of disbudding the American resistant vines as continued as long as it was necessary, and the usual thorough cultiva- on carried out. Only by keeping the surface soil loose can the moisture retained. This is a most important, and in fact an essential opera- on in this district, and cannot too often be insisted upon.

Wine was made during March from the varieties grafted on resistant ocks. Only about 800 gallons were made as the plantation is but young, ıd the area is limited. Heavier losses were incurred this year than ever fore by the depredations of birds, which have been a veritable scourge is season throughout the district. The wine made though small in quan- y is of considerable promise. The grapes crushed were Shiraz, Malbec, ıd a few Cabernet. Photographs were taken of some of these vines just fore vintage, but do not do adequate justice to the crop, as much of the uit was on the side of the vine away from the camera. Two photo- aphs, taken by my son, are reproduced in this report as illustrations. he bunches and berries of Malbec were exceptionally fine, much superior anything previously seen here, and probably unequalled elsewhere.

SHIRAZ GRAFTED ON HYBRID NO. 3306.

By request of the Viticultural Society of Victoria, samples of our wines, ırticularly that made from grafted vines, were sent to the Autumn Ex- hition to be held early in May.

leave till early in the year, several successive invasions having swept over. The young vines responded readily to the application of water, and have made excellent growth. A considerable extension of the area of resistant stocks has been arranged. This would have been planted earlier but for the complete failure of the cuttings being grown outside for the purpose. This season at the head station there is not only a good percentage of strikes,



SHIRAZ GRAFTED ON RUPESTRIS METALLICA (CAPE).

but the rootlings are exceptionally vigorous. As no artificial waterings could be given here owing to the fact that the dams were empty, the satisfactory condition and growth of these cuttings are all the more surprising. The young vines planted out permanently last spring are thriving well, and trellising is now being erected to enable the maximum of suitable wood to be obtained. In future, the whole of the nursery stock will be grown at Wahgunyah where there is an ample water supply.

FARM.

This district, like most of the State, has passed through an exceptionally dry season, with a spell during January of extreme and long-continued heat. Old residents aver it has been the worst season here for over fifty years, and there is very little feed anywhere.

Early in the year the summer crops, which had suffered from the invasions of locusts, began to dry up. On 22nd January, both the maize and sorghum had to be cut, and owing to the adverse conditions the yield was only about a ton to the acre. Rain fell on the last day of that month and started the sorghum into a vigorous second growth. On the 23rd March and following days this was cut, and yielded over four tons to the acre as the second crop. Both these cuttings were converted into silage, without which it would have been impossible to carry on. The value of drilling in these crops and keeping the intervening spaces well worked was never more satisfactorily demonstrated than in these plots, and even such returns in the present season are due to this cultivation. Several severe cases of sorghum poisoning, entailing considerable losses of stock, have occurred in

this district. By exercising a little care no trouble whatever has been experienced in this respect on the College farm. Doubtless the dry season favored the development of the poisonous properties, and where losses were reported the sorghum had been either grazed or fed too young or too green.

Last year, as soon as the hay crops (oats and wheat) were taken off the land, the stock were turned in on the stubble, and then as soon as possible the land was broken up. The result has been that it got the full benefit of any showers that fell, and subsequent cultivation was an easy matter. Ploughing has not been interrupted, while many farmers are still waiting for rains to enable them to commence.

Fallowing—so important in any system of farming—receives due attention, both bare and rape fallows being adopted in different fields. Twenty-six acres of new land have already been broken up this year, and it is proposed to put down under pastures, such land as has already been cropped several seasons and needs a change and rest. Early sowing seems essential to success in this district, and already the following areas are sown:—Oats 25 acres, rye and barley 15 acres, and lucerne 6 acres. In connection with the Departmental scheme for improving the Victorian wheat yields, test plots of stud wheats are being sown. Subsequently the selection of the most desirable strains will be carefully carried out.

The stock are holding their own fairly well. The young cattle were sent to Wahgunyah, where there was a little feed adjoining the nursery. Their temporary removal was a great relief to the sparse pastures on the College farm. Fifteen head are still at the Government farm at Whitfield.

BOYS AND GENERAL.

The boys are doing fairly well, and pick up the various operations readily. For some time past this season, as in previous years under the present management, Mr. Wilkinson has taken the new boys a few at a time, and given them individual and practical instruction in grafting. The "old boys" are given frequent practice under the same efficient supervision, to "keep their hands in." Several lads are already expert with the knife, and there is a healthy rivalry amongst them regarding the best made grafts, and the expedition with which these can be turned out. In slack times or on wet days this practice is undertaken with beneficial results, for by the time the grafting season arrives, the lads are ready for the work.

The general health has been on the whole satisfactory. There has been but little sickness. One boy had to attend the depôt hospital to undergo an operation for the removal of a rather large post-nasal growth. He is now, however, convalescent and back at College.

A number of visits as usual have been paid to both establishments by persons interested in the working of this institution. Visitors are gladly welcomed on week days at all reasonable hours. Just before the end of the quarter the Hon. A. O. Sachse, M.L.C. (Minister of Public Instruction), Mr. Bowser, M.L.A., and Mr. F. Tate, M.A., (Director of Education), accompanied by a large party, paid a visit to the College. The Hon. the Minister expressed his gratification at the work being done here in connection with the training of the boys.

Lectures, many of which are illustrated by either the optical lantern or the microscope, were as usual regularly given by the Principal. For the quarter under review short courses on Cereals and Economic Botany (Origin of our food plants), were commenced, and the life histories and methods

of coping with Phylloxera, Locusts, Scale insects, and Aphides were given. A lantern lecture was also given on Australian exploration. Whenever a pest, insect or fungus, is in evidence, in the vineyard, orchard, nursery, garden, or farm, it is made the text for an address on its life history and means of controlling or eradication. The boys are keen on noticing any new pest, and the awakening of this vigilance cannot be over-estimated as an educational factor.

The ministers of Rutherglen regularly attend and conduct services. A harvest festival service was conducted by the Rev. C. Fowler, and the variety and excellence of the products used in the decorations were highly commended by the visitors who attended.

During the Principal's absence on leave owing to a breakdown in health, Messrs. Wilkinson (foreman) and Brooke (farm manager) excelled themselves in their loyal and energetic efforts. The successes achieved here are largely due to their unremitting attention throughout the year, backed up by the members of the staff.

Mount Xavier Experimental Farm, Ballarat.

A. Kenny, Manager.

Crops.—*Maize.*—The maize crop turned out fairly well. Some of it was very good, fully 6 feet high, whilst that in the clayey ground did not do so well, but on the whole the crop was satisfactory, more especially seeing that there was no rain of any consequence during the quarter. Had the rains that Ballarat generally gets in February or early in March fallen, there would have been a good crop. The maize was sown in drills 3 feet apart. The land between was kept well cultivated and the result showed that good crops can be grown without irrigation if the land is well broken up and kept open.

Potatoes.—In consequence of the continued dry weather the crop will be similar to those in other parts of the State where no rain has fallen. In fact the potato crop in the Bungaree district (especially those planted early in November) will be very poor. The later planted potatoes will be the best. The crop on the farm will be very fair in some parts provided there are no frosts during April. The land will be much benefited by the cultivation it received.

Green Fodder.—Five acres have been sown with a mixture of barley, rye, peas, beans, and oats. The barley and rye are nicely up and look well.

Ploughing.—In January all the land that had been cropped with hay got a thorough good ploughing with the single furrow plough; since then it has been harrowed, disced, rolled, and cultivated with the cultivator and is now in splendid tilth for cropping. The land that was cropped with maize is being ploughed and will be similarly dealt with. About 30 acres will be ready by the second week in April for sowing with half oats and half wheat.

Sundry Works.—It was found necessary during the last two weeks to put on three labourers to bevel off the sides of the main open channels and to cart the soil that had been excavated from the channels into the low places. This will add very much to the appearance of the farm. A drain has also been cut to divert the flood water from the Railway into the main channel.

Stock.—The horses are doing very well. They are in excellent health and working condition.

FOURTH PROGRESS REPORT ON VITICULTURE IN EUROPE.

F. de Castella.

Reconstitution in Spain.

Spain is one of the important viticultural countries of the world. According to statistics, it occupies a very high rank so far as wine production is concerned. In addition to this it is one of the largest producers of raisins, and ships enormous quantities of fresh grapes each year to Northern Europe and America. Nor must the large quantity of grapes consumed in the fresh state within the country be lost sight of. As regards diversity of products obtained from the vine; of varieties of vines and of methods of cultivating them and treating their fruit, few countries present a more interesting field for study.

Spain is but little known by the rest of Europe. Much of what one usually hears about it is inaccurate and exaggerated, and sometimes even maliciously untrue—it is a much maligned country; one hears of its faults but seldom of its virtues. An impartial observer will no doubt find things to criticise, but he will also find much to admire and interest him. So far as sobriety and good manners are concerned, to mention only two of the chief virtues of the Spaniard, there are few countries which could not learn something in Spain, and as regards its agriculture, and especially its viticulture, they have long ago reached a high state of perfection.

The Spaniard has long been known as a good gardener. The Moors were noted for their skill in cultivating the soil, and their irrigation works in many parts of Spain are admired and copied to the present day. When driven out of the country in the 15th century their cultural methods remained behind them, being adopted by their Spanish conquerors. So far as cultivation of the soil, and the suiting of the different operations to local climatic conditions, I was surprised at the efficiency and thoroughness with which the work is usually done. The Spanish vigneron is a tradesman who takes a pride in his work and does his best to carry it out thoroughly, though usually for poor remuneration.

A consideration which rendered the country especially interesting to me was the similarity of its climate to that of Victoria—much more so, in fact, than even that of Southern France. In this respect there is little difference, for example, between Northern Victoria and Andalucia. So far as rainfall, and its distribution and temperature are concerned, Jerez or Sevilla are strikingly similar to Rutherglen or the Goulburn Valley. The success of familiar Australian trees such as blue gums, sheoaks, and grevillias amply demonstrates this. Even in Montpellier (South of France) blue gums are occasionally cut down by strong winter frosts, but not so in Andalucia. One of our common sheoaks (*Casuarina quadrivalvis*) is extensively used for street planting in Jerez, and thrives well. Eucalypti grow everywhere as well as they do with us, and, at Malaga even sugar cane is cultivated on a commercial scale, though it is true that the crop is frequently lost through frost.

This similarity of climate should render Spanish experience valuable to us. It was this fact, as well as the variety of its vine products and the special nature of many of them, that induced me to devote so much time to the study of the vine in the different viticultural regions of Spain.

Spanish viticulture includes, as has been said, several distinct branches. We have in the first place the three main subdivisions of wine production,

raisins, and table grapes, but each of these may be still further divided. For example, the shipping of fresh grapes packed in granulated cork from Almeria and Gigona is a very different matter from that of table grapes for local consumption. Then, again, as regards raisins, the dessert raisin industry of Malaga differs both as regards methods of culture and treatment of fruit, from the pudding raisin industry of Denia (what we know as Valencias or Lexias).

As regards wine we have a still greater variety of products, few other countries turning out so many distinct types of wine as Spain does.

Though chiefly known abroad for the sherry grown at Jerez, in the extreme south of Spain, this constitutes but a small proportion of the total wine production of the country. The bulk consists of common beverage wines similar to the *Vin Ordinaire* of France—light dry wine, either red or white, which is the common drink of the people; for in Spain, as in France, Italy, and other Latin countries, wine is a food and not a luxury, a small quantity being regularly taken with each meal (early breakfast excepted) by all classes of society from the highest to the lowest, in the same way as we drink tea in Australia.

In Australia we are not a wine drinking people and we do not realize the importance of this class of wine in Southern Europe. As in France, so also in Spain, this class of wine is usually consumed before it is eighteen months old. It is ready for use early, in the same way as cider, and does not improve with age sufficiently to be worth maturing, nor would maturation be possible at the low price—7d. to 9d. per gallon—at which this wine must be sold wholesale in order to place it within the reach of the lower classes. It is this *Vin Ordinaire* which forms the bulk of the wine production of Spain. It is produced throughout the country varying slightly in type according to district. The province of La Mancha turns out enormous quantities of this type of wine, as also many other portions of Spain. In La Mancha the best known centres are Val-de-Peñas and Manzanares.

Next in importance came the heavy blending wines of Alicante, Arragon, and other districts—wines of 24 and 25 per cent. of proof spirit and possessing much color and body. Enormous quantities of these wines were shipped annually to France in the days of short production which followed the destruction of French vineyards by phylloxera. Now that France has reconstituted her vineyards and can produce all the wine she requires this trade has died out altogether, to the great misfortune of the Spanish growers who produced these strong blending wines.

Then we have table wines—*vino de mesa* in Spanish—light dry wines of sufficient quality to be worth maturing and bottling. Of these the best are certainly those of La Rioja, a large district in the north of Old Castile, of which Haro and Logroño are the chief viticultural centres. Good wines of this type are also bottled in Val-de-Peñas and Manzanares, but La Rioja holds the palm in Spain for wines of this type. Many of these wines compare favorably with the cheaper French clarets. Vineyard owners do all in their power to make them as similar as possible. Most of the Rioja cellarmen are recruited in Bordeaux, and the wine is made and handled on exactly similar lines to those practised in Bordeaux cellars.

Next in order of importance so far as quantity is concerned, but easily first as regards quality, comes the wine of Jerez, San Lucar, and Montilla—the sherry of commerce and the chief glory of Spanish viticulture. These magnificent wines and the special treatment by which they are obtained demand a separate report. We need only briefly mention them here.

Near Jerez several special wines are made, such as the Muscat of Chippiona and the Tintilla of Rota, in which a considerable trade used to

be done with England as a Communion wine known as Rota Tent. At Malaga several distinct types are made which will be described in detail later.

Further north, in Cataluña, we find the wines now so largely shipped to England under the name of Tarragona port, the name of the seaport town whence they are shipped having displaced the older name of Priorato, that of the district where they are grown.

There are many other special wines made in different parts of Spain limited to the small localities in which they are produced, and therefore not of sufficient commercial importance to merit special mention here.

This specialization in wine making is one of the striking facts in connexion with Spanish viticulture. In most districts is has been found that one type of wine can be produced of greater excellence than any other, and this is the type which is exclusively produced there. This is in strong contrast to our Australian multiplicity of types turned out on each vineyard and an object lesson we would do well to profit by.

Though it has taken time for the more modern ideas of scientific agriculture to be put into practice in Spain, perhaps owing to the thorough manner in which cultivation according to the ideas of the old school were carried out, and perhaps also owing to political difficulties, the Government of the country is waking up to the need to assist growers, chiefly in the way of experimental and demonstrational work, and within the last few years the Agricultural Department, under the able direction of the Visconde de Eza, has done much to make up for the delay in starting. The men in charge of agriculture in each province whom I had the good fortune to meet impressed me by their efficiency and keen interest in their work. An increasing interest in the natural industries of the country is one of the striking features of the Spain of to-day. A gradual transformation is taking place, the result of which is to be seen in the increased prosperity of the country.

As regards reconstitution, much good work has already been done, but much also remains to be done. Spain remained free from the pest longer than most of the vine countries of Southern Europe, but the insect eventually found its way thither. Its progress has been very irregular. Some of the leading districts were destroyed long ago, and in these reconstitution has been accomplished for a good many years; others have only recently succumbed, and in them reconstitution on American stocks is now in full swing. Others again are as yet free from the insect, but as it has already been found in vineyards situated on their borders, their ultimate destruction is merely a matter of time. These doomed districts include very large areas under vines, and the amount of reconstitution which will be carried out will no doubt have a considerable effect on the financial aspect of vine culture in Spain. It is doubtful if anything like the totality of the vineyards will be replanted. This applies more especially to the cheap "vins ordinaires," for at present prices their production scarcely pays; in many parts the cultivation of the olive is proving more profitable.

Spain being attacked after reconstitution had been an established fact for a good many years in France, Spanish growers were able to turn to that country for guidance in the work before them. The influence of French experience is evident throughout the country. The same stocks that one meets with in France are again to be found in Spain. Their behaviour under different conditions of soil, and more especially of climate, afforded an object lesson of the greatest importance, and it was most instructive, after studying these same vines in France, to again see them and be able to inquire into their qualities and defects under conditions so similar to ours

as those prevailing in Southern Spain. A few seedlings and hybrids have been raised in Spain, but their number is very limited and the great majority have been introduced from France.

The earlier districts reconstituted did much pioneer work under adverse circumstances. The Government either did not then believe in the ultimate success of American vines, or did not realize its duty, and nothing was done to assist growers, who were entirely left to their own resources. The early invaded districts, such as Malaga, Jerez, Montilla, and large areas in Cataluña, have been completely reconstituted without any Government aid whatever.

A wiser spirit prevails nowadays, and in the more recently attacked regions such as Navarre, Valencia, and La Rioja, the Government is doing its utmost to help growers with information and advice. Resistant cuttings are supplied at a low cost and in one or two provinces the Government is supplying small growers with grafted rooted vines.

I must here place on record my deep gratitude to the different Spanish viticulturists with whom my work brought me in contact. The courteous and friendly reception I met with on all sides touched me deeply. Wherever I went I was most warmly received and cordially assisted.

Spain does not lend itself to so simple a subdivision, from a viticultural point of view, as Portugal does. In each province one finds localities devoted to a different branch of the viticultural industry, a good many of which require to be dealt with separately. For example, in the great province of Andalucia we have the wines of Jerez, the raisins and wines of Malaga, and the important fresh grape shipping industry of Almeria, each of which must be described separately. My itinerary in Spain was as follows:—After spending three weeks in Jerez—my longest stay in any one place in Spain—I visited in turn Malaga, Almeria, Granada, Montilla, Córdoba, Manzanares, Madrid, Pamplona and other small centres in Navarre, Logroño, Haro, and El Ciego in La Rioja. I then proceeded to Barcelona, whence I visited Villa Franca del Panades, Reus, and San Sadurni de Noyes. From there I went to the raisin and orange region of Valencia, Gandia, and Denia, and several other small places in their neighbourhood. From Denia I returned to France, calling again at Valencia and Barcelona, and also visiting Figueras and Llansa, near the French border. My visit to Spain occupied nearly three months.

The Jerez or Sherry District.

Jerez was the first viticultural region I visited in Spain. I arrived there on the 6th November from Cadiz, which port I reached by sea from Lisbon, *viâ* Gibraltar. The Sherry district being a most interesting one from a vine-growing as well as a wine-making stand-point, I propose to deal with it at some length.

Phylloxera made its appearance here in or about 1895, and in a very short space of time completely destroyed all vines except those growing in very sandy soil in which, here as elsewhere, the progress of the insect is much slower. In the majority of the soils of Jerez the conditions are most suitable for the development of phylloxera and its effects were very severely felt. Reconstitution was immediately commenced, and though only a small portion of the destroyed vineyards has as yet been replanted enough has been done to once more prove the success of the American stock, even under most unfavorable soil conditions, for Jerez in Spain, and Cognac in France, are the two districts where the greatest difficulties in the way of adaptation have been met with, of all the districts I have

inspected in the carrying out of my mission, and yet, in both of them, once the proper stock has been found, the solution of the problem has given the usual satisfactory results.

Together with Jerez we may consider San Lucar de Barrameda, its near neighbour, well known for the Manzanilla type of wine it produces, and Montilla, about 100 miles further north, where one finds a small patch of soil exactly similar to that of Jerez in the midst of surrounding country of quite different type. The wine of Montilla is a sherry which it would be difficult to distinguish from that of Jerez. This similarity is the direct outcome of the identity of the soils and affords an interesting proof of the great influence of the nature of the soil on the quality of the wine. The soil of Montilla is identical with the Afuera or Albariza soils of Jerez which will be described presently.

SOILS FOR SHERRY.

The soils of Jerez may be divided into the following classes :—

1. *Afuera or Albariza soils.*—The typical white soils which produce wine of the highest quality.
2. *Barros or clay soils.*
3. *Arenas or sands.*
4. *Alluvial deposits.*

It is only in the case of the first that reconstitution has presented any serious difficulty ; in the others it has been a comparatively simple matter though even in them care must be taken to avoid stocks which fear excess of lime.

The *Afuera* soils are usually the summits of low hills which, a few years ago, were covered with vines. The lower portions of these hills and the flats, or rather low land between them, consist of stiffer soil and is good wheat land. The upper parts of the hills where the best wines are grown are not so rich. These soils fell in value very considerably after the destruction of the vineyards situated on them by phylloxera—they are not rich enough to grow wheat, it is not easy to find a crop that will give profitable results on them. Most of the owners were ruined when the phylloxera exterminated their vineyards and only a few have had sufficient capital to face the heavy cost of reconstitution. The area replanted only amounts to about one-eighth or perhaps less of the vineyards which existed previously, but those who have replanted are quite satisfied with the result and are extending their plantations yearly. They have no doubt as to the quality of the wines produced by the grafted vines. As in other districts, the gloomy opinions of some authorities have not here met with confirmation. The high quality of the wines grown on resistant stocks was pointed out by the delegate for Andalucia at the International Viticultural Congress held at Angers last July, Don Leopoldo de Salas y Amat.

It is the Afuera soils which are really typical of the district. They are white and powdery when dry, but become very sticky when wet. In this respect they remind one of the soil in the neighborhood of Horsham. They are, however, far richer in carbonate of lime, some of them containing as much as 70 per cent. of it and even more. This excess of lime is what has given most trouble in connection with reconstitution for most American vines are very sensitive to this element. Even now, after ten years of experience, some of the most difficult soils are still giving

trouble and in them the American stocks which support the highest proportion of lime do not give complete satisfaction.

The subsoil of this class of land consists of a soft bluish-grey marl, exceedingly rich in lime, which easily breaks down to soil when exposed to the air. It is met with at a varying depth, sometimes as near the surface as a foot or so but usually deeper. This marl is known in Spanish as Tosca; it is in the soils where it appears near the surface that reconstitution has given most trouble. Strange to say, these were often the very soils which, prior to the appearance of phylloxera, produced wines of the highest quality. All the soils of Jerez contain much lime, even the sandy ones, but in these it is chiefly in the subsoil. It is in the Afuera soils which produce wines of truly extraordinary quality that the carbonate of lime percentage reaches a really high figure, sufficient to seriously interfere with the problem of reconstitution.

The *Barros* are a less distinct type; they are clays containing a varying proportion of sand. They also contain a good deal of lime.

The *Arenas* or sands vary considerably. Large areas of them exist in several parts of the district. Their reconstitution has been comparatively easy.

At San Lucar itself the soil is very sandy, chiefly sea sand washed up from the sea, but at a short distance from it towards Babaina one gets into low hills of the regular Afuera type very rich in carbonate of lime, but these are looked upon rather as belonging to Jerez, all their wine going to the latter town. Along the coast we also have Chippiona, famed for its Muscat, Rota for its Tintilla, and other small places. These are situated in very sandy soil and in this part of Spain as elsewhere sand maintains its property of enabling the ungrafted European vine to resist phylloxera. The sandy soils of Jerez, San Lucar and Chippiona are decidedly less resistant than those of Portugal or France, and although the vines growing in them are not killed immediately they suffer from the effects of phylloxera and after a certain number of years cease to possess sufficient vigor or to yield profitable crops. The length of time the vines last after they have been attacked varies greatly; quite near Jerez there are even now a good many ungrafted European vines still alive after a ten or twelve years' struggle with the insect. The crops they are giving are poor and these vineyards are being gradually rooted out and replaced by resistant ones. Their slow destruction is in strong contrast with the rapid extermination of all the vineyards planted in the Afuera soils where the action of phylloxera was far more deadly. In the still more sandy soils of San Lucar and Chippiona the vines resist longer, and about here a good many vineyards continue to give fair results ungrafted; but even here reconstitution is now being pushed on actively.

The resistance of sandy soils seems to depend on several factors, one of the most important of which appears to be the percentage of lime in the soil. According to Dr. D. Juan Gavilan, a Spanish authority who has studied the subject, sandy soils capable of resisting phylloxera contain at least 60 per cent. of sand, not too fine; not more than 1 per cent. of lime carbonate and less than 4 per cent. of clay. The tertiary sandy soils of Jerez contain a considerable proportion of lime, and this probably prevents them from resisting as well as other sands similar to them in appearance.

The point is one which interests us in Australia, the freedom from excess of lime of most of our sandy soils is thus strongly in their favor,

and it is very probable that we possess large areas of sandy soils where it will be possible to grow ungrafted Europeans.

STOCKS USED IN THE JEREZ DISTRICT.

Though many of the proved stocks in general use in France have been tried, a limited number have become generally popular, and these only need be considered here.

At the Granja or Government experimental farm a large number of experimental plots have recently been established, but they have not yet reached an age when much information can be obtained from them. It is to private vineyards that we must turn for information. In many of these interesting experimental plots have been established long enough ago to render them instructive.

PURE AMERICAN SPECIES.—These are chiefly represented by Rupestris du Lot and Vitis Berlandieri, Riparias not being used to any extent. I have generally found Riparias to be the most sensitive of all American vines to excess of lime. It was, therefore, only to be expected that with this element so plentiful as it is in the soils of Jerez that they would not give good results.

Rupestris du Lot, here as elsewhere, has its partisans and its adversaries —chiefly the latter. I know of no stock which has given rise to greater differences of opinion. In soils which suit it, it gives entire satisfaction. It must, however, only be planted in soils which suit it, or decidedly unfavorable results will be obtained. In Jerez it is not popular. Many soils contain too much lime for it. Though in France it is held to tolerate a fairly high percentage of this element it is not considered eligible in Jerez in soils containing over 12 per cent. of carbonate of lime and soils less calcareous than this are the exception. In these soils it is appreciated and I met several growers who are entirely satisfied with it and who continue to plant it. In the alluvial river soils it is not popular on account of non-setting of fruit troubles. Rupestris du Lot is not a rich soil stock; in such it promotes great growth of wood at the expense of the fruit production. It is hardy and vigorous and in poor deep soils where it can get its roots down it is undoubtedly a most valuable stock. Jerez is a dry district and R. du Lot is not one of the most drought resistant. On the whole, though giving satisfactory results in some of the Barros and Arenas soils, it does not occupy a leading position, and in the Afuera soils is quite superseded by other more suitable stocks.

Vitis Berlandieri.—Among the pure American species this is the most interesting one met with near Jerez, which is one of the rare districts in Spain where it is used on anything like a large scale. Its difficult propagation has prevented its employment in other districts, but in the most calcareous of the Afuera soils, where no other American species will remain green, in spite of its several drawbacks and the great expense of reconstituting a vineyard with it, this stock is rather extensively used. It will be remembered that V. Berlandieri was the species recommended for very limey soils as the outcome of the mission of M. P. Vialla, who was sent to the United States by the French Government to seek for a wild American vine, capable of standing these soils, which are so often met with in France.

In some of the Afuera soils the percentage of lime is as high as 70 and even 80 per cent., and this in a fine state of division which renders its influence all the more unfavorable. In such soils V. Berlandieri is almost the only stock which can be used and in these difficult cases it has

proved its value here as in France. In addition to its power of resisting lime it possesses several other good qualities. Growing wild as it does in the driest parts of Texas, it is one of the most drought resistant of American vines and in the dry climate of Jerez it finds itself quite at home.

Besides, it has marked affinity for most European scions. It seems also to possess some of the best qualities of V. Riparia, such as hastening maturity of the fruit and preventing non-setting at flowering time. It appears to be free from the two chief defects of Riparia, viz., difference in diameter between stock and scion and want of durability. It would appear to be one of the most vigorous, most prolific and longest lived of stocks. Though its use on a commercial scale is only of recent date the odd vines which exist in most experimental plots afford most encouraging evidence. In fact, it is probable that, but for its difficult progagation and slow growth during its first few years, it would displace most of the other stocks now in general use, for these are its two defects.

The difficulty with which its cuttings strike has already been referred to. When planted in a nursery in the ordinary way only 2 or 3 per cent. of the cuttings strike. All sorts of devices have been tried to increase the strike percentage, such as making herbaceous cuttings under glass or striking with the aid of bottom heat, &c. None seem to have satisfactorily solved the problem and as a rule rooted Berlandieris can only be obtained by means of layering. Bench grafting is out of the question, but this does not much matter in Southern Spain where vineyard grafting is invariably employed in preference to bench grafting as we shall see presently.

Slow growth in its early years is the second important defect of this species. Even if two year old rootlings be employed when planting, they can seldom be grafted before they have been growing in the vineyard for a couple of years. Even after they are successfully grafted development is at first slow, and under the most favorable conditions a crop of grapes can scarcely be reckoned on before five or six years from plantation, whereas with other stocks, at the fourth year a fair crop is usually obtained. Of pure Berlandieris there are several varieties named after the introducer or selector—most of these have come to Spain from France. The most popular in Jerez are B. Lafon Nos. 1 and 2 and B. Resseguier Nos. 1 and 2.

AMERICO-AMERICAN HYBRIDS.—In the soils where the lime percentage is not too high such as some of the Arenas and Barros and some of the alluvial soils near the river I found Riparia x Rupestris hybrids doing well. As a rule 3309 does better than 3306 or 101-14 but even in these soils Riparia x Rupestris hybrids are less used than I should have expected, no doubt owing to the excess of lime. The bulk of the Afuera soils are altogether too limey for Riparia x Rupestris. Taken as a whole, the Jerez district is one in the reconstitution of which these stocks have played a small part. One of M. Couderc's hybrids, Rupestris x Calcicola No. 160-19, is rather largely cultivated and gives satisfaction even in some of the Afuera soils.

Berlandieri Hybrids.—Several of these are used on a large scale and are popular. The Berlandieri x Rupestris are rather difficult to propagate and of the Berlandieri hybridised by other American species the Berlandieri x Riparia hybrids are the most popular sorts. Berl. Rip. Nos. 402a, 157-11, and 34 E., are most valuable stocks, and in Jerez are the most popular of the Americo-American class, the two first being perhaps most used.

VINIFERA-AMERICAN or FRANCO-AMERICAN HYBRIDS as they are termed in France.—This division comprises the stocks which are by far the most popular and most widely used in all but the most difficult of the Afuera soils where pure Berlandieris alone give satisfaction. Even in fairly limey soils of this type, containing up to 60 per cent. of carbonate of lime, many Franco-Americans give excellent results.

Vinifera x *Berlandieris*.—Hybrids between Vitis Berlandieri and European "Cepages" are very popular. These hybrids possess in a high degree the excellent qualities of the Berlandieri parent, whilst its drawbacks are considerably reduced. Many of these hybrids strike from cuttings quite readily. The majority of them grow with sufficient vigor in their earlier years though their development is scarcely so rapid as that of some of the other American stocks. So far as fructification, early maturity and quality of products are concerned they rank among the very best American stocks. Most of these have been raised in France; amongst those most largely used in Spain we find numbers 41 B, 33 A, and 333. The resistance of these vines to lime is almost as high as that of pure Berlandieris, and in all but the most difficult soils they may be looked upon as the most reliable stocks to be used; 41 B is perhaps the one which has been most largely planted, and it has given very general satisfaction.

1202 and A.R.G. 1.—Among the other Vinifera-Americans (non Berlandieri), the best known are our old friends just named. These are among the most popular stocks and have been used more largely than any others. 1202 (Mourvedre x Rupestris) is generally known in Spain simply as *Mourviedro*. It is used perhaps more extensively than any other stock about here. It is capable of prospering and remaining green even in pretty highly calcareous soil and is the basis of reconstitution even in many Afuera soils. In all but the very bad ones where Franco Berlandieris or even pure Berlandieris can alone be depended on, it gives ample satisfaction. A.R.G. 1 (Aramon Rupestris Ganzin No. 1) is known in Spain is simply as *Aramon*. This stock does not stand quite so much lime as the previous one and it is in the Barros and Arenas calcareas that it finds its chief use. In all but the Afuera soils it is one of the most popular stocks and is in many cases preferred to Rupestris du Lot in soils which suit both. Of the several different individual seedlings resulting from the original hybridisation by which this vine was raised, three only were preserved. We have thus A.R.G. No. 1, No. 2 and No. 9. A.R.G. 1 is the one most frequently met with but there are individual differences between the three which are worthy of note. A.R.G. 2 resists lime less than A.RG. 1, and this is the chief reason for its less extensive use. It may prove of value in Australia for it is said to be even more drought resistant than No. 1. Of recent years A.R.G. 9 has become very popular in certain quarters. It is said to be more vigorous than A.R.G. 1 and to resist lime to the same extent but as in at least one or two cases, some doubt seems to exist as to the authenticity of the original vines from which the cuttings were taken the question is a complex one. It would appear that all three are stocks of value. I have secured authentic vines of each and propose to test them side by side under Australian conditions. When speaking of A.R.G. it is usually A.R.G. 1 which is meant and it is certainly one of the most remarkable of the Vinifera-American class.

Several of the newer French Vinifera-Americans are now being tried in this district and are giving very encouraging results.

Two Vinifera-Americans of Spanish origin raised near Jerez are also worthy of note though of too recent introduction for their superiority

to be yet thoroughly established. These are hybrids raised by Don Leopoldo de Salas y Amat, the well-known viticultural authority of Malaga. One is a hybrid between 1202 and Vitis Berlandieri; it is designated as No. 4-3 Salas. It appears to combine the good qualities of its two parents. The second is a Muscat x Rupestris and is known as 2-9 Salas. Much is expected of this hybrid as a stock for the Gordo Blanco.

(To be continued.)

THE ORCHARD.

James Lang, Harcourt.

The weather still continues abnormally dry, and the situation is now becoming very serious for all the producing interests of the State. It is to be hoped that copious rains will soon fall, and relieve the tension.

Gathering in the apples and pears, even in the latest districts, should now be completed. It is a mistake to let them hang too long on the tree, as there is great waste through falls, and fruit cracking on the trees. The crops on the whole have been light, but the good prices ruling will help to make up for the deficiency in quantity. The London prices cabled so far have been very satisfactory, and will give a fair price to the shipper. One of the most satisfactory results of the export of fruit in large quantities is the relief it gives to the local market, steadying prices and keeping them at a remunerative rate. Growers should therefore export a fair proportion of their crop of apples and pears, as they will not only obtain a payable price for their export fruit, but will enhance the value of that kept back for the local market.

The sowing of peas for green manuring should be completed as early as possible. If sown later than the middle of the month the result will be very unsatisfactory. Preparing ground for extension of orchard should be continued at every opportunity, so that the work will be well advanced by planting time.

The bandages placed around the trees for trapping the codlin moth should now be removed, scalded, dried, and put away for use next season. When time permits the trees should be carefully scraped and all loose bark removed and burnt. Broken limbs should be neatly sawn off and smoothed. If these means are adopted the numbers of the grubs will be considerably reduced—every grub destroyed now may mean hundreds less next year. Owing to the dry weather experienced the past season has been unusually favorable for the codlin moth, and breeding has been continued right through the season.

Advantage should be taken of any slack time to look over the fences, and do all necessary repairs. Surface drains and ditches should be cleaned out so that the surplus water will have a clear course to get away. Underground drains, at least 2½ feet deep, should be put in where required. Draining tiles are the best to use: the size 2½ inches in diameter is mostly used for ordinary drains, while for main drains 4-in. tiles should be utilized. Stones also make a good drain; put the rougher stones at the bottom, and the smaller ones on top. If leaves or some brush is put on top, it will prevent the soil from settling down between the stones when filling in. Bush saplings cut into 6-ft. lengths and covered with brush will make a good temporary drain.

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THE MELBOURNE MILK SUPPLY.

T. Cherry, M.D., M.S., Director of Agriculture.

(A Paper read before the Victorian Branch of the British Medical Association.)

The milk supply of Melbourne and the production of milk and manufacture of milk products, such as butter and cheese, are controlled by the *Milk and Dairy Supervision Act* 1905. In addition to this, the sale of milk is also controlled by the provisions of the Health Acts, including the *Pure Food Act* 1905. Generally speaking, it may be said that the conditions of production, including the inspection of the dairy herd, the management of the farm, and the transport of the milk, are administered by the Department of Agriculture, while the inspection of the milk during delivery and the regulations with regard to adulteration and standards of purity are administered by the Central Board of Health and the local municipalities. Any clashing is avoided by the fact that the standards for milk are fixed by the Food Standards Committee, a body appointed to advise the Board of Health and the Minister of Agriculture on such matters, so that uniformity of standard is secured throughout the State.* The Milk and Dairy Supervision Act, with which we are immediately concerned, provides not only for the inspection and control of the industry, but it also comprises a very large measure of technical education for the farmer. The salient features of the Act are as follows:—"Every dairy farm or dairy must obtain a licence annually. A report from a supervisor or inspector setting forth that the conditions of either the dairy farm or dairy are unsatisfactory in character is sufficient to entail the refusal of the licence for the next twelve months. Furthermore, the inspector may at any time prohibit the use of any cow or the sale of milk or other dairy product, and very full powers are given over all animals affected with notifiable diseases."

As the Act is intended ultimately to embrace the entire State, or a total of about 1,000,000 dairy cattle, it is evident that if the inspection is to be

* The present standard is—fat 3·5, non-fatty solids 8·5; total solids 12.

more than a mere formality a very large staff is necessary to efficiently carry out the duties of inspection. Under these circumstances, it was decided that the idea of employing veterinary inspectors only should be abandoned, and instead thereof the main part of the work should be carried out by a body of men known as supervisors under the direction and control of a fully-organized veterinary staff. Accordingly, the Act requires that each supervisor must have had *bonâ fide* practical experience in dairy farming and the allied branches of agriculture, and shall be selected after written and practical examination by examiners appointed by the Governor-in-Council. In such examination, special importance shall be attached to the practical part. The Act further requires that each supervisor shall become personally acquainted, as far as possible, with every owner of a dairy farm, dairy or factory, and the conditions prevailing in the premises of every one licensed under the Act. It is his duty to confer with or advise such owner on matters connected with his farm whenever instructed to do so by the authority administering the Act, and to inspect and examine all premises, utensils and products, and also all animals and their food and water supply on the farms.

The provisions of the Act came into force in the Metropolitan area, Ballarat, Bendigo, and Geelong, on 1st July, 1906. Other areas have been brought under the operation of the Act from time to time. At present the Act is in force in eighty-four out of a total of two hundred and six municipalities in the State.

It will be seen from the above outline of the duties of the supervisors that the success or failure of the Act depends chiefly on the way in which they carry out their duties. In their hands is the power, not only to efficiently inspect the milk supply, but also to make or mar the prosperity of the farmer. A satisfactory milk supply requires to be profitable to the producer as well as clean and wholesome to the consumer. To produce good milk is an expensive business, requiring a large amount of capital as well as a high level of technical skill. The farmer must build up a high-grade dairy herd, and provide suitable and sufficient food for them throughout the year. Both these operations are amongst the most difficult in the whole range of agriculture. It will, therefore, be seen that the union of instructors with inspectors is not an accident. Provided the supervisor can gain the confidence of the farmer, he can do more to increase the health and prosperity of the State than falls to the lot of the great majority of citizens. The farmer has to be shown clearly that sound methods of agriculture are more profitable than thriftless ones. Tact and knowledge are, therefore, prime requisites in the supervisor. While possessing only a sound general knowledge of health and disease in animals, he must be able to act as a veterinary scout to detect the first symptoms of disease, and refer them for decision to skilled experts.

APPOINTMENT OF SUPERVISORS.

For public information it may be advisable to indicate in some short detail the manner of selection of the supervisors, in order that an idea of their qualifications for the positions they occupy may be gained.

The first examination was held in May, 1906, the Board of Examiners appointed being Dr. Cherry, Director of Agriculture; Mr. S. S. Cameron, M.R.C.V.S., Chief Veterinary Officer; Mr. R. Crowe, Superintendent of Exports; and Cr. John Hancock, Dairy Farmer, Colac.

Some months prior to the holding of the examination the following syllabus of subjects for examination was prepared and published, and a number of candidates took advantage of the opportunity of attending preparatory classes established at the Melbourne Veterinary College for the subjects contained in the syllabus:—

EXAMINATION FOR SUPERVISORS.

The examination for dairy supervisors will include written, oral, and practical tests, and will require of candidates a knowledge of—

Dairy Practice, including (*a*) stock management, the breeding, rearing, feeding, and management of dairy cattle; the composition and value of the most important foods or food stuffs; the factors which influence the yield of milk. (*b*) Dairy farm management, including the preparation and cultivation of the land, and the subsequent handling and preservation of the crops; pasture, water supply. (*c*) Milk and dairy produce, their characters, production, examination, preparation, and manufacture, methods of handling and transit; dairy utensils and appliances.

Dairy Sanitation.—(*a*) The arrangement and construction of buildings and yards; (*b*) disposal of drainage and manure; (*c*) methods of cleansing and disinfection.

Stock Ailments.—A sound knowledge of the notifiable diseases under the Act, including (*a*) symptoms and diagnosis; (*b*) methods of isolation; and (*c*) quarantine and disease prevention.

Evidence of ability to verbally expound details and facts concerning the above subjects, and to carry on inspectorial duties in a tactful and educational manner, will receive a special recognition in the examination.

No special text-books are prescribed, but candidates may consult the following with profit:—Bailey—*Principles of Agriculture.* Wing—*Milk and its Products. Year-Book of Agriculture for* 1905.

Seeing that the examination of stock ailments will only cover notifiable diseases, there is no book which deals with these alone in concise form. Standard modern works which may be consulted for these diseases are Law, *Vet. Medicine*, Vol. IV., or Bollar, *Diseases of Cattle.*

The examination, which extended over ten days, comprised:—(*a*) A written paper. (*b*) An oral examination before the Board of Examiners. (*c*) A practical examination on Knowledge of Stock, and the details of Dairy Farming practice. Of 260 candidates who presented themselves twenty-two passed.

In December, 1906, a second examination was held, and seventy candidates presented themselves. The majority of these had been in attendance at special classes for dairy supervisors conducted at the Melbourne University during the previous six months. These University classes embraced instruction, by means of lectures and demonstrations in the following subjects:—(*a*) Animal Physiology, by Professor Osborne. (*b*) Bacteriology, by Dr. R. J. Bull. (*c*) Principles and Practice of Dairy Farming, by Messrs. R. Crowe, R. T. Archer and P. J. Carroll. (*d*) Diseases of Cattle and Veterinary Science, by Messrs. S. S. Cameron, M.R.C.V.S., and W. A. N. Robertson, G.M.V.C.

The second examination was conducted on the same lines as the first, with the result that of the seventy candidates twenty passed.

On appointment, the supervisors have been subjected to further training in their duties, both by means of lectures and practical inspection work,

each new supervisor doing his work for a time under the guidance of an experienced officer, until sufficiently capable and familiarized with his duties to be left to act alone.

THE IDEALS TO BE AIMED AT.

The general results deduced from bacteriological investigations during the past decade seem to point to the following facts:—(1) With good administration, it is possible to obtain milk sufficiently clean to be delivered to the consumer without either pasteurization or sterilization. Special facilities for cooling are required in the summer. (2) The lactic acid bacteria are beneficial rather than harmful to the human alimentary canal. (3) Raw milk, provided it is sufficiently free from putrefactive bacteria, is a better article of food than sterilized, or even than pasteurized milk. The greater the temperature to which milk is exposed, the greater the destruction of the most valuable food substances it contains, the serum albumen, and the special compounds of iron, lime and phosphoric acid.

It is fortunate that the problem of providing a satisfactory supply of raw milk is simplified by the fact that the only common bovine disease that is transmissible in the ordinary way to human beings is tubercle. All the others may be avoided by cleanliness. This applies to typhoid fever, and to the various forms of intestinal disorder that may be grouped under such names as diarrhœa, enteritis, gastritis, &c.

Undoubtedly, the most up-to-date arrangements under which the milk supply of a large town is handled are similar to what obtains in Copenhagen, Berlin, and a few other large cities. The milk is produced on large farms, where the cows are well fed, housed, and groomed, and kept under constant veterinary supervision. The milk is cooled at once after milking, and kept at near the freezing point until distributed. Special methods of filtration, pasteurization, &c., are carried out as circumstances direct. Contrasted with some such method as the above, it may be said that the Melbourne milk supply comprises about 1,400 dairies, supplied by 40,250 cows on 3,200 farms. There is no large organization which is likely to control any appreciable percentage of the distribution. Many of the most progressive farmers are comparatively wealthy, and do not look upon dairy farming as offering inducements much better than those offered by other less exacting branches of agriculture. Neither municipalities nor philanthropic institutions have established either model dairy farms or distributing centres. Cold storage, though freely available, is utilized to the extent of only a few hundred gallons a day during the summer months. If the quality of a city milk supply may be judged by the incidence of gastro-intestinal disease in infants, that of Melbourne was just middling—there was undoubtedly much room for improvement, but on the other hand, there were no great abuses calling for reform. Under these circumstances it was felt that a judicious system of instruction, with inspection, would probably, achieve the best results. That, while a greatly improved milk supply would be secured, the business could at the same time be made more profitable and attractive for the farmer.

The conception of the milk supply to be aimed at, then, comprises healthy, well-fed cows, cleanliness, rapid cooling, and prompt delivery, and, in addition, good, general management, so that the farm becomes a centre of progressive prosperity. In many countries, the enforcement of healthy cows and clean milk would comprise the sum of the duties of the

local or general health authorities. In Victoria, on the other hand, we are so accustomed to the State taking an active part in the every-day life of the community, that interference in all the directions indicated is recognised as being quite within the functions of a public department. Accordingly, we have made a commencement by obtaining systematic information on the following points :—

(*a*) *Concerning Dairies.*—(" Dairy " includes every business connected with the storage or distribution of milk.) Situation and municipal district ; daily distribution of milk ; districts in which the milk is distributed ; farms from which the milk is obtained ; quantity supplied ; how delivered to the dairy ; how retailed or distributed ; number of employés ; number of customers ; milk storage ; sanitary condition of premises, utensils, &c.

(*b*) *Concerning Farms.*—Situation and area ; area cultivated ; number of employés ; number of cows ; daily milk yield ; disposal of produce ; food supply ; acreage and variety of crops grown ; quantities, kind, and cost of fodder purchased ; water supply ; milking methods ; storage of milk ; condition and management of cows ; health of stock ; deaths of cows during previous twelve months ; number of abortions and notifiable diseases in cows ; sanitary conditions of premises, including cow-shed, drainage, manure disposal, dairy utensils, and machinery.

A confidential report is also attached, showing the recommendations made by the supervisor, and his remarks on the observations made during the visits of inspection. The reports on subsequent visits show the extent to which the recommendations have been carried out.

One of the all-important qualifications for the position of supervisor is tact. We wish him to get on such terms with the average farmer that his visit is welcomed. Instead of making the inspectorial part of the duties to be the only object of his visit, we wish the educational factor to be kept prominently to the front. If possible, he is to become the friend and adviser of the farmer. Hence the term " supervisor " was adopted, rather than " inspector." As far as possible, three inspections of all farms are carried out each year, but the administration of the Act is elastic enough to enable us to treat each individual farmer on his merits. In order to keep some men up to the mark it is necessary to pay frequent visits at short intervals. The majority of farmers, however, show every desire to conform with the requirements of the Act, and in several districts the supervisors are sent for by the farmers for purposes of consultation, so that nearly the whole of their time is occupied in attending to these calls. It will be seen, therefore, that we have secured a body of men as supervisors who give ample promise to realise in this respect the spirit in which the Act was framed.

THE WORK ACCOMPLISHED SINCE 1906.

Three points have been kept before the supervisors as matters of primary importance—to secure clean milk, to encourage better provision for feeding the cows, and the elimination of disease from the udders of the cows. Each of these requires separate consideration :—

(1) *Clean Milk.*—This means practically the control of the number of bacteria in the milk at the time it is delivered to the consumer. Leaving for the moment the question of the micro-organisms of specific diseases, the first great source of contamination is the little particles of cow-dung which

find their way into the milk pail. These fall from the hairs of the udder and adjacent parts of the cow, are introduced by dust and flies, and are transferred from various parts of the animal by the hands of the milker. By focussing attention on these points, we have endeavoured to materially reduce the initial dirt contents of the milk. Each supervisor sees the milking carried out at one farm at least, every morning and evening. The cooling of the milk is carried out by passing it over a gridiron or cone cooler, the water for this process being, as far as practicable, obtained from underground tanks or wells. This supply is much colder during the summer months than that obtained from the Yan Yean or other city water supply. The milk room, where the cooling is carried out, is usually built at a distance from the cow-shed, and air disconnection is always insisted on. No regulations have been drawn up to control the conditions under which these and similar points are carried out, but each case is decided on its merits. With regard to dairies, very satisfactory progress has been made in bringing them up to a good standard of efficiency, and special efforts have been made to have the milk kept in well-ventilated rooms or cupboards, where it is safe from the flies. I am informed that, in spite of the abnormally hot summer that we have just passed through, the incidence of infantile diarrhœa and other milk diseases has been unusually light this season. It may be premature to claim that this result is due in some measure to the efforts of the Department of Agriculture, but it is certain that the work of the supervisors has been directed with the specific object or accomplishing this end.

(2) With regard to the steps that have been taken to improve the general system of farm management, particularly in regard to the feeding of the cows, the details are perhaps not of sufficient interest to medical men to warrant more than a passing remark. The teaching of the Department is to the effect that little progress can be made in general agriculture while farmers depend exclusively upon grazing. Pastures may be important, but pastures must be supplemented by provision made by the use of the plough. The cultivation and the conservation of fodder crops either dried or in the form of silage are steadily inculcated, and the production on the farm of food materials rich in protein is looked upon as one of the all-important conditions to the economical production of milk. The teachings of physiology are translated into practical axioms for the farmer. The increase during the past twelve months of the area under fodder crops from 35,000 acres to 64,000 acres is perhaps an indication that Victorian farmers are taking this lesson to heart.

(3) In order to detect disease in the udder, each quarter of the organ is very carefully examined at least twice a year. Any suspicious cases are prohibited for the period of fourteen days, during which time, or as soon after as possible, an inspection is made by one of the veterinary officers, and the prohibition either made permanent, removed, or extended. In doubtful cases the tuberculine test is used. If a cow is permanently prohibited, she is branded accordingly.

The Act does not confer any power to kill diseased animals, but on the other hand, the value of dairy cattle in Victoria is seldom so great as to warrant a farmer keeping them when once they have been permanently prohibited. They are, therefore, almost invariably slaughtered under supervision, and in nearly every case, a *post-mortem* examination is made in order to verify the diagnosis by a member of the Veterinary Staff.

Besides the contagious (notifiable) diseases, the supervisors also have the power to prohibit the use of a cow on account of any condition, local or general, likely to cause the production of unwholesome milk. They have been instructed to prohibit for acute simple inflammation of the udder, and this of course includes abscess. This brings me to speak of conditions of the udder that are perhaps not well known to medical men.

The general idea is that milk drawn from the healthy udder of a cow, after the first few strains are rejected, is absolutely sterile. As a matter of fact, each quarter of an udder has to be separately tested before this point can be settled. The comparatively large duct, and the fact that a drop of milk often oozes from the teat, lead to bacterial infection in a considerable proportion of cases. Generally, such infection does not extend beyond the ampulla or milk reservoir at the base of the teat; but in other cases, the micro-organisms are able to establish themselves, and set up conditions ranging from slight interference with the milk to acute inflammation of the udder.

Although what may be called living milk has a physiological power to inhibit the growth of many kinds of bacteria, it is not surprising to find that occasionally lodgment may be effected by species that are able to grow in the udder. "Coccal" cows have been well recognised for a number of years, and it is probable that the normal source of lactic acid bacteria is the interior of apparently healthy udders. Bacteria may, therefore, be present without causing any symptoms; or they may cause merely partial coagulation of the milk. On the other hand, the symptoms may range from simple swelling without heat or tenderness up to the formation of an acute abscess. Furthermore, all these degrees of interference with the normal function may become chronic. It is the destruction of the secreting cells by an inflammation, often of slight severity, that causes the ordinary "caked" or "lost" quarter. Hence there is room for wide differences of opinion as to the precise degree of abnormality which warrants prohibition. The supervisor has instructions to prohibit only in cases in which he can justify his action. All cases of acute inflammation are, therefore, included, and a number of passing affections of a transient nature. About one-half of the prohibitions are subsequently removed by the veterinary officer. The interests of both consumer and producer are thus conserved. The one is not supplied with milk during the acute stage of any attack, while the use of the cow is ultimately preserved to the farmer.

I think it may be claimed that our system of supervision is a success. No system of inspection is of any value unless it is thorough. For thorough work, one man is required for every five or six thousand cows. The question of cost is, therefore, an all-important one. At present the annual fee of sixpence per cow, together with the registration fees from the dairies, covers about two-thirds of the total cost of administering the Act. The time of the veterinary staff is conserved, and their energies concentrated on the animals that require special attention. At the same time, the visits of these officers form a good check on the way the supervisors do their part of the work.

From the subjoined table, it will be seen that out of 72,000 cows at present under the operation of the Act, only 66 per 10,000 have been found unfit to yield milk for human consumption on account of disease. Tubercle was discovered in less than 2 per 1,000, and in exactly one-half of these cases was the udder affected. In contrast with this remarkable absence of tubercle, there has been discovered an equally remarkable

prevalence of actinomycosis of the udder. This condition is rather more common than tubercle (seventy cases as against sixty-one). The diagnosis has, in every instance, been verified by microscopic examination at the Bacteriological Laboratory at the University. Mr. Cameron, Chief Veterinary Officer, in drawing attention to this condition in a recent report, concludes as follows :—

"I have said that the publication of this information will most likely arrest the attention of scientists. This, for the reason that, so far as I can ascertain, such an extraordinary prevalence of this condition of the udder has not been elsewhere recorded throughout the world. It may be that we have experienced an unusual epizootic of the condition. At first, I was inclined to think that the condition might have been associated with an unusual prevalence of vesicated teats during the previous spring. But the finding of the condition has been continuous throughout the year, and seems likely to continue so. Indeed, I am being gradually driven to the conclusion that it is not so much the prevalence of udder actinomycosis that is unusual, but rather that it has been unusual for it to be discovered. In this connexion, it may be questioned whether there has been elsewhere so careful an examination of the udders of milking cows made in such large numbers within such a period as that under review. In any case, the whole matter of this discovery of an unexpected prevalence of udder actinomycosis is interesting, and is worthy of further investigation, which it is intended shall be carried out at the earliest opportunity."

The result of the inspection of 72,000 cows for the year 1906-7, and the first eight months of 1907-8, is as under :—

Prohibitions and Results of Post-mortem Examinations:—

	1906-7.	1907-8 (8 months).
Cows prohibited	1015	654
Cows examined by veterinary officers ...	917	734
Prohibitions removed	415	344
Prohibitions extended	235	143
Prohibitions made permanent	256	220
Cows destroyed	115	187

Results of Post-mortem Examinations:—

	1906-7.		1907-8.	
Tuberculosis, systemic	28	55	35	69
Tuberculosis, mammary	27		34	
Actinomycosis, systemic	6	33	15	58
Actinomycosis, mammary	27		43	
Mammitis	15		15	
Tubercle and Actinomycosis	3		5	
Miscellaneous	4		7	

Before concluding, I may point out that the Act enables a model dairy farm and dairy to be established in each milk area or municipal district. There is no reason why model distributing centres should not be established in the poorer parts of the city and suburbs, and I am in hopes that before long the Department will establish a number of model farms.

ADDENDUM.

Since the above paper was read, His Excellency the Governor and Lady Talbot, who have long been interested in the question of a special milk supply for sick children, have suggested that advantage should be taken of the present opportunity for launching such a scheme on a small scale. With the view, therefore, of focussing the points for discussion at the next

meeting of the Victorian Branch of the Association, the following scheme is submitted. It is practicable, capable of being taken in hand at once, and lends itself to future extensions :—

Outline of a Scheme for a Model Milk Supply for Children.

(1) Arrange with one or more specially selected and approved suburban dairy farms to supply the milk under proper supervision. To immediately strain and cool it as far as practicable, and deliver it at one of the city railway stations or other depôt within an hour of milking.

(2) Arrange with the University Bacteriological Laboratory to chill (pasteurizing if necessary) and bottle the milk. Returned bottles to be cleansed and sterilized.

(3) Arrange with the Children's Hospital and other institutions to distribute the milk, chiefly to out-patients. Milk to be paid for at current rates, except under special circumstances.

(4) Arrange for quick transit in insulated cases from railway station to Laboratory, and from Laboratory to distributing centres by cab or motor van.

To start with, probably fifty gallons a day will be required. The sale of the milk at 5d. per quart should pay for the purchase of the same at say 1s. per gallon, after making full allowance for free distribution and waste. The plant at present at the Laboratory would meet all requirements until the consumption largely increased, and more distributing centres are in operation.

EXPERIMENTS ON THE HEATH LAND AT PORTLAND.

F. E. Lee, Agricultural Superintendent.

It is a matter of surprise that, hitherto, so little attention has been paid to the agricultural possibilities of the extensive areas of sandy land which border our coast line. In the extreme South Western corner of Victoria, in the neighbourhood of Portland, is to be found a large area of this character, bearing a dense growth of what is known as "heath," interspersed with small belts of timber. Although one of the very earliest settlements, the residents of the town have up till quite recently depended more upon maritime industries than upon agricultural pursuits. Remote from Melbourne the district, although favorably known as a watering place, attracted little or no attention as a field for agricultural development until the disastrous drought in 1902. Stress of circumstances in the northern districts, and the search for food for starving stock resulted in the Portland district being invaded by farmers from the Wimmera and Mallee. The possibilities of the heath land were not long in becoming recognised. New ideas and methods of handling the heath were introduced, with the result that a number of properties changed hands, and what had formerly been dense thickets of scrub soon became arable land. The writer was invited by the member for the district, Mr. Hugh Campbell, M.L.A., to personally inspect the heath areas and report upon the soil potentialities.

Analysis of Heath Soils.

Samples selected from representative situations showed upon analysis potential fertility of no mean order as under :—

Chemical Analysis.

Area	Nitrogen.	Phosphoric Acid.	Potash.	Lime.	Chlorine.
	%	%	%	%	%
South Portland Heath	·165	·019	·031	·140	·124
North Portland Heath (centre) ...	·132	·040	·060	·184	·010
North Portland Heath	·076	·028	·041	·108	·004

Mechanical Analysis.

Area	Fine Gravel.	Coarse Sand.	Medium Sand.	Fine Sand.	Very Fine Sand	Silt.	Fine Silt.	Clay.
	%	%	%	%	%	%	%	%
South Portland Heath...	Nil	3·70	11·15	54·05	2·90	3 05	1·20	3·20
North Portland Heath (centre)	·75	20·55	23·50	35·40	1·50	4·25	·75	5·55
North Portland Heath...	·30	9·10	19·70	50·90	3·70	3·65	1·00	5·55

The North Portland (centre) heath shows the best proportion of plant foods, the South heath being richer in nitrogen, but poorer in phosphoric acid, potash and lime, and also contains a great excess of chlorine (salt). The mechanical analyses show the proportions of gravel and sand, and clay to be :—

——	Sand and Gravel.	Clay.
	%	%
South Portland	71·80	7 45
North Portland (centre)	81·70	10·55
North Portland	83·70	10·20

The figures indicate in all cases a too high proportion of sand to clay. Such soils are very porous and do not retain moisture long enough to permit of the production of abundant crops. During summer such soils also absorb heat rapidly and the surface becomes loose. The obvious deficiencies are humus or vegetable matter which enables soil to store up moisture and to retain the mineral ingredients—phosphoric acid and potash near the surface. In the South Portland soil there is, moreover, a great excess of chlorine or salt which indicates a necessity for drainage.

AN EXPERIMENTAL FIELD ESTABLISHED.

In order to demonstrate the possibilities of the heath land to produce crops with the aid of artificial manures, an area of 6 acres on the Bridgewater Road was placed at the disposal of the Department by Messrs. Edwards Bros. The site is typical of the heath land. About 20 chains of drains were opened up to a depth of 2 feet, into which tea-tree poles were placed, then covered with heath tops and the sand filled in again. The drains acted splendidly and the discharge of water throughout the winter months was most satisfactory. A ton of lime per acre was also applied to the land, two or three months prior to the seed being sown. In October, 1907, an acre each of rape, potatoes, sugar beet, maize, *sorghum and Japanese millet*, was planted. The area was divided into four equal sized sections at right angles to the direction of the crops and the following manure applied:—

Section A.—1½ cwt. superphosphate per acre.
B.—1½ cwt. superphosphate and ¾ cwt. sulphate of ammonia.
C.—No manure.
D.—Same as B with the addition of 45 lbs. potash sulphate.

GENERAL VIEW OF THE EXPERIMENTAL FIELD, SHOWING SURROUNDING SCRUB AND SAND DUNES WITH MARRAM GRASS PLANTATIONS IN THE BACKGROUND.

THE OBJECTIVES OF THE EXPERIMENT.—The constitution of the field was designed to serve the interests of the sheep owner, dairy farmer, and general farmer by demonstrating that the crops necessary for the successful carrying out of these industries could be profitably grown. A definite scheme of rotation is also provided for, and as the experiment progresses, the crops will be alternated and new classes of crops introduced. As far as can, at present, be judged the end to which land of this character can most profitably be put is—dairying, fattening stock and mixed farming. The restoration of the necessary vegetable material to the soil can only economically come about through the agencies of stock and crop residues. Cereal cultivation is not likely to be permanently profitable on

account of the proneness of the climate to induce rust and other fungus diseases. One factor which must to a large extent influence the future method of working the land in question is the already established Freezing Works which can absorb without difficulty all the fat lambs, beef, pigs,

JAPANESE MILLET.
Section C in foreground. Section B in background.

poultry, &c., produced in the district. The advantage of direct export from Portland Harbor is inestimable and in the writer's opinion there is no reason why this portion of the State should not in time rank among the leading exporting centres of the products named.

JAPANESE MILLET, SECTION D, SHOWING DAMAGE DONE BY KANGAROOS.

YIELDS OF CROPS.—New land, the presence of a mass of roots brought to the surface during cultivation, and a somewhat dry season were all

prejudicial to maximum returns in the first year. The results, however, from some of the crops are distinctly encouraging as under:—

Crop.	Section A	Section B.	Section C.	Section D.
	Tons	Tons.	Tons.	Tons.
Rape	2·9	5·1	·7	4·1
Sugar beet	5·7	5·4	4·5	7·3
Millet (green)	10·0	11·3	6·9	11·0
Maize (green)	2·9	3·0	Destroyed by Kangaroos.	
Sorghum (green)	2·2	2·3	·6	Destroyed by Kangaroos.

The Japanese millet apparently is a crop well suited to the conditions of the heath land. As it can be fed either as a green fodder, hay, or silage, its growth is to be advocated for the dairy farmer. The yield of

GROWTH OF MAIZE.

rape was also satisfactory, the residues of the crop and the droppings of stock fed upon it will do much towards improving the physical condition of the soil. The yields of maize and sorghum are poor, largely owing to the insufficiency of moisture to support a large growth. As the land improves with cultivation and cropping, fodders will show better returns. The returns from the sugar beet are especially encouraging and point to the possibility of growing this crop on a large scale. The roots were well grown, of good shape, and should show a high sugar content judging by external appearances.

Potato Yields.—Potatoes consisting of 13 varieties gave most satisfactory returns and have clearly indicated the suitability of some varieties and the unsuitability of others which was the principal purpose of this portion of the experiment.

When the following figures are studied it will be noted that Blue Prolific, The Bruce, Sutton's Abundance, Copperskin, Up-to-date, Black Prince and Orr's Wonder have each given profitable returns. The more familiar varieties—Beauty of Hebron, Brown's River and both kidney varieties—show inferior yields. It is to be regretted that the yields from Section

POTATO YIELDS.

Variety.	Section A.	Section B.	Section C.	Section D.	Quantity of Tubers marketable.			Quantity of Tubers unmarketable.		
	1½ cwt. Sup. rphosphate.	1¼ cwt. Superphosphate; ¾ cwt. sulphate of Ammonia.	No Manure.	1 cwt. superphosphate; ¾ cwt. sulphate of Ammonia; ¼ cwt. Potash sulphate.	Section A.	Section B.	Section C.	Section A.	Section B.	Section C.
	per acre.	per acre	per acre.	per acre.	per acre.	per acre.	per acre.	per acre.	per acre.	per acre.
	tons. cwt.	tons. cwt.	tons. cwt.	tons. cwt.	tons. cwt.	tons. cwt.	tons. cwt.	tons. cwt.	tons. cwt.	tons. cwt.
Blue Prolific	4 10	5 16	2 4	Destroyed by Kangaroos.	3 4	4 10	0 12	1 6	1 6	1 12
The Bruce ...	4 8	5 14	1 4		2 14	4 0	0 4	1 14	1 14	1 0
Sutton's Abundance ...	3 6	5 12	1 6		2 0	4 6	0 16	1 6	1 6	0 10
Copper-skin	3 10	5 2	1 4		2 8	3 6	0 12	1 2	1 16	0 12
Up-to-date	3 12	4 4	1 0		2 10	3 4	0 8	1 2	1 0	0 12
Black Prince	2 18	3 14	1 4		2 2	3 2	0 16	0 16	0 12	0 8
Orr's Wonder	3 0	3 6	1 0		2 6	2 14	0 6	0 14	0 12	0 14
Bismark	2 2	2 10	1 0		1 14	1 16	0 8	0 8	0 14	0 12
Brown's River	1 18	2 0	1 2		1 2	1 2	0 8	0 16	0 18	0 14
Royal Kidney	1 16	2 2	0 14		0 16	1 6	0 4	1 0	0 16	0 10
Lapstone Kidney	1 2	1 2	0 4		0 14	0 14	0 2	0 8	0 8	0 2
Daniel's Sensation	0 14	1 2	0 4		0 6	0 10	0 0	0 8	0 14	0 4
Beauty of Hebron ...	0 10	0 14	0 2		0 4	0 12	0 0	0 6	0 2	0 2
AVERAGE FOR ALL VARIETIES ...	2 11	3 6	0 19	...	1 14	2 8	0 7	0 17	0 18	0 12

The potatoes were clean shaped and free from disease. Extensive field notes regarding the period of maturity were made during growth.

D, which was destroyed by kangaroos and rabbits, are not available as there is every reason to believe that the additional potash manure would have materially increased the potato yields as was found to be the case with the fodder crops.

EFFECTS OF MANURES ON THE QUANTITY AND QUALITY OF POTATOES.

It is satisfactory to find that, without exception, every variety of potato has responded uniformly to the manure dressings. The average returns from section A show that 1½ cwt. of superphosphate has produced 2 tons 11 cwt. of potatoes. Section B with the same amount of superphosphate, plus ¾ cwt. of sulphate of ammonia, has increased the yield to 3 tons 6 cwt. Section C, without manure, has only produced 19 cwts. per acre. In other words a dressing of 1½ cwt. superphosphate and ¾ cwt. sulphate of ammonia—costing 15s. per acre—has been shown to be able to produce 2 tons 7 cwt. of potatoes over and above the yield of unmanured land.

POTATO CROP. EXAMINING TUBERS.

Even at the worst of times potatoes are rarely worth less than 30s. per ton, so that what might appear to be a relatively costly application of manures can be justified with potatoes at bed-rock prices.

As regards the action of the manures on the size of individual tubers, the classification into "marketable" and "unmarketable" clearly shows the advantage of intelligent manuring. For example the proportion of the former to the latter in each section is as follows:—

—	Section A.	Section B.	Section C.
	Tons cwt.	Tons cwt.	Tons cwt.
Marketable	1 14	2 8	0 7
Unmarketable	0 17	0 18	0 12

It will be noted that in Section A there are 2 cwt. of marketable potatoes for every 1 cwt. of unmarketable. In section B there are nearly

3 cwt. of marketable tubers for every 1 cwt of unmarketable and in Section C, nearly 2 cwt. of unmarketable for every 1 cwt. of marketable. Detailed criticism could hardly go further than this.

Mr. Seymour, Potato Expert, who had charge of this section of the experiment, in his report says:—"The results of the experimental plots on heath land at Portland may be considered very satisfactory, the yields of some varieties being very good—showing a ready response to the manure dressing. The tubers were well grown, type perfect. Two varieties were tested for cooking quality at the A.N.A. Exhibition with the following results:—

Variety.	Possible Points			Total.
	5	3	2	
	Flavour.	Mealiness.	Whiteness.	
Bismark	4	3	2	9
Royal Kidney	3	3	2	8

Bismark scored 9 out of a possible 10 points and Royal Kidney 8 out of a possible 10. The whole experiment points to the fact that this land can be put to a profitable use with proper treatment."

FUTURE WORKING OF THE LAND.

It is proposed by the Department to actively prosecute the experimental work on the heath land, and during the present season an acre of mixed

A CROP OF SUGAR BEET.

grasses embracing 10 to 15 varieties will be sown down and will subsequently be grazed by stock. A leguminous crop will be sown on the field with the purpose of being ploughed in later for green manure. In the spring a variety of fodder crops will be again sown with the object of determining the most suitable kinds for dairying purposes. It is, moreover, intended to extend the scope of the drains and probably also to wire-net the field.

When one views the uninviting nature of the adjacent country and then turns to the small cultivated plot the contrast is remarkable.

That better results will ensue from the projected work than has already been the case, I am confident, and the knowledge already gained will form an excellent basis for similar operations on the part of the new settler on the heath land.

STRAWBERRY CLOVER.

W. Younger, Dairy Supervisor.

Strawberry clover is indigenous to South Europe and North Africa; to Persia; the Canary Islands and Azores. Since its introduction to South Gippsland it has spread over many thousands of acres and in that part is considered far superior to any other grass grown there. It is continuous in growth and is distinct in appearance from all other varieties, being of a trailing habit and having much smaller leaves. Strawberry clover was first introduced into South Gippsland by the late Mr. George Black, of Tarwin Meadows, and has proved its exceptional fattening qualities by the fact that the stock from this estate have for many years realized the highest prices in the Melbourne yards. It has also been planted by residents and adjoining landholders who regard it as the best grass for dairying. It will hold its own against any other grass in flats, swampy land, wet or marshy places; stands flooding, even with brackish tidal waters, and grows much fodder during summer. Horses prefer it to all other grasses.

Propagation of strawberry clover can be effected in two ways—either by portion of the root or by seed; the former, however, is the most satisfactory and is generally adopted. It will grow from a small root, if necessary, but a piece about 3 inches square is best, a little more or less being of no consequence. In planting it among ordinary grasses hoe up a piece of sod to the depth of a few inches. Place clover sod in this hole and firmly press it into the broken soil. Plant about every yard and in two years, where the situation is at all favorable, the clover will have worked its way completely through the grass, meeting at all points. It spreads with seeds mostly through the dung of animals; in fact, the seeds apparently germinate much more satisfactorily in this way In land that is cultivated for the reception of the plants the roots are chopped up into small pieces, sown broadcast, and rolled in. The smallest portion will grow.

Plants can be obtained in quantities, from a sack upwards, at 15s. per sack, delivered at Tarwin Railway Station. A sack of first class plants, that is strong stems not too many leaves, should give at least 2,000 plants. Seed can be obtained from Melbourne seedsmen at 6s. per lb. in the husk.

This valuable grass would undoubtedly flourish in the valleys of the Yarra, Goulburn and other districts, where, as yet, it is practically unknown and would greatly improve the pastures and increase the carrying capacity of the land.

DISEASES OF THE SKIN.

S. S. *Cameron, M.R.C.V.S., Chief Veterinary Officer.*

NON-PARASITIC SKIN DISEASES.—Hidebound and Chafing—Itch (*pruritis*)—Nettle Rash or Urticaria—Eczema, Simple Eczema, Scaly Eczema, Rain-rot in Sheep—Mud Fever—Mallenders and Sallenders—Cracked Heels—Grease (Pustular eczema)—Warts or Angleberries.

I. NON-PARASITIC SKIN DISEASES.

Hidebound and Chafing.

The term "hidebound" is applied to a condition of the skin in which it is dry, harsh and tightly drawn over the subcutaneous structures instead of being soft, pliable and easily grasped by the hand. Such a condition is an indication of unthriftiness and wasting; it is especially marked in diseases of the digestive organs (*e.g.* worms) and in the emaciation stages of tuberculosis or other chronic disease in cattle but may occur as a symptom in many other diseases. When in this condition the skin is particularly liable to "chafe" and the hair becomes easily rubbed off wherever it is exposed to harness friction.

TREATMENT.—Obviously the most rational treatment is to overcome the disease of which hidebound is a symptom; but in those cases in which no serious systemic disturbance exists an attempt should be made to improve the general tone by the giving of tonics and by dietetic alteratives. The mucilage of linseed is particularly valuable in such cases. It is made by boiling a pound of linseed in a gallon of water over a slow fire until a thickish slime is formed, of which half a pint or a pint may be given mixed with the feed at the evening meal. Carrots, green-stuff, and boiled barley are also useful. Such like "changes" should be supplemented by the giving of skin tonics of which Fowler's solution of arsenic is perhaps the best. Fowler's solution may be made by boiling together 1½ drams each of arsenic and carbonate of potash in one pint of water until dissolved, the resulting solution being made up to one pint by the addition of water. Dose—one tablespoonful in feed twice daily.

As an external application for chafes nothing is better than a liniment composed of equal parts of olive oil and water emulsified by the addition of a little carbonate of soda.

Itch or Pruritis.

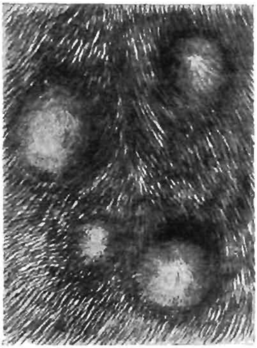
Itchiness is a symptom of some disease or affection of the skin itself or of some internal (bowel) irritation. For example—itchiness of the tail is often symptomatic of worms (*oxyuris vermicularis*) in the rectum, and it is a frequent symptom of indigestion and of intestinal worms. It is also present in mange, lousiness and other skin diseases. Want of grooming by allowing the accumulation of scurf and dirt is a frequent cause of itchiness of the tail and mane.

For the subjugation of itchiness the cause must be ascertained and removed; if arising from mange the *acaris* must be destroyed; if from intestinal worms these must be evacuated (see treatment for intestinal worms given later). To rid the mane and tail of scurf and dirt an excellent application is a smartly shaken mixture of kerosene (four tablespoonsful) and water (one pint). This should be rubbed in at the base of the hair which should then be well brushed and combed. To allay itchiness of the skin

prussic acid lotion is most efficacious—two drams of prussic acid to a quart of water is sufficiently strong. It should be sopped on to the itchy part two or three times a day, and being a deadly poison care should be taken that it is not allowed within the reach of other animals or children. When used for dogs it is necessary to muzzle the animal so that he may not lick the part otherwise fatal poisoning will result.

Nettle-rash or Urticaria.

This acute affection of the skin is manifested in the horse, dog and pig. *In the latter animal it has been mistaken for swine fever on account* of the skin lesions, but on observation for a day or two such a mistake is inexcusable.



THE BLEBS OF NETTLE-RASH.

SYMPTOMS.—The characteristic symptoms are manifested very suddenly. There may or may not be a preceding itchiness. The skin becomes covered with elevated "blebs" (vesicles) or boils exactly resembling those produced by a nettle-sting (*urtica* = a nettle). The skin of the neck and shoulders is usually first affected, then that of the back and buttocks. The boils vary in size and may coalesce forming blotches or raised patches the size of a man's hand containing a watery or serous fluid. The hair on the elevated parts is raised and when the hand is passed over the surface of the skin a "hobnailed" impression is felt. As a rule the symptoms subside as rapidly as they appear and in the course of a day all is well again.

CAUSES.—Nettlerash frequently occurs on abrupt change of diet especially in gross or full-feeding animals; indigestible or unusual food is a common cause. In man the eating of fish sometimes precipitates an attack. The disease also occurs along with catarrh, jaundice or other derangement of the digestive tract. In all these cases it is probable that the condition arises from irritation of the skin from abnormal substances circulating in the blood which have been absorbed from the alimentary canal. A sudden chilling of the skin when the body is overheated often results in the development of the disease. In this case it

would appear to be not so much due to the irritation of the skin by cold as to the retention of injurious substances in the body under the influence of cold which would otherwise be eliminated by the skin or excretory organs.

TREATMENT.—A laxative saline drench should be given and usually this is all the treatment required. If the irritability of the skin is excessive the prussic acid lotion recommended for itch may be given.

Eczema.

Excepting the conditions specially dealt with in this chapter all skin affections of an inflammatory or irritative character may for practical purposes be classed as eczemas. They are known under different common names such as prickly heat, summer mange, blood boils, heat pimples, dandruff, and they may be scientifically divided into *lichen simplex*, the diffuse form of eczema when the pimples are scattered; *herpes* when the pimples appear in patches; *strophulus* when the hair is shed and bare patches of skin left; *psoriasis* and *pityriasis* when the disease assumes a chronic scaly condition.

In **Simple Eczema** there is an eruption of small pea-like pimples on the surface of the skin at any part but most commonly on the sides of the neck or shoulders, the flank and inside the thighs, and at the root of the tail. At first they are simply small hardish elevations but soon they become filled with a watery fluid (serum) and form "vesicles." These may either dry up or burst leaving a scaly scab which peels off in a few days. Sometimes the vesicles become transformed into pustules containing matter (pus) and ill-looking sores are formed while healing.

CAUSES.—"The disease appears to be brought on by some influence which interferes with healthy action of the skin such as checked perspiration, errors in feeding, irritation from wearing woollen or dirty clothing or from dirt being allowed to accumulate on the skin, want of grooming, a heated state of the system, or by infection. In some cases its cause appears to be constitutional, in others local." (Hayes). The affection is common at the change of the seasons, spring generally, and some horses suffer year after year about the same season.

TREATMENT.—Horses on hard feed should be changed to laxative diet consisting of grass or other green feed and a daily bran mash with which from two to four ounces of Epsom salts may be mixed. As a local application a little glycerine may be applied or the olive oil and soda emulsion previously recommended for "chafes." When pustular sores form, Tincture of Creolin (creolin 1 part, methylated spirits 15 parts) forms an effective dressing and it also has a marked effect in stimulating the growth of hair. In obstinate cases arsenic in the form of Fowler's solution (page 338) may be given as a skin tonic and alterative powders containing an ounce of Epsom salts and half an ounce of sulphur are also advantageous.

For eczema in the dog (in which animal the disease may vary from a slight vesicular irritation to a condition of extensive suppuration or great thickening and encrustation of the skin) internal treatment with Fowler's solution of arsenic (5 to 10 drops per day in the drinking water) should be accompanied by the application of zinc ointment in early cases or Iodide of Sulphur ointment in confirmed and intractable cases.

Scaly Eczema (*psoriasis* and *pityriasis*) is a chronic condition of the skin characterized by the formation and continuous peeling of dry

branchlike scales. The affection is mostly localized at the base of the mane, root of the tail and about the neck, shoulders and croup.

TREATMENT.—Local applications do not appear to do much good. The disease must be attacked through the system and after a cleansing of the bowels by a purgative or laxative medicine (page 157) a course of tonics (arsenic and sulphur alternated) is the best possible treatment. Care should be taken in grooming not to irritate the skin and only the softest brushes and cloths should be used.

Rain Rot in Sheep.

This is an eczematous condition of the skin of sheep occurring in poorly fed animals with sparse wool. The surface skin of the neck, shoulders, back and tail becomes softened by rain or dampness. A thickening of the the skin follows and may be accompanied by the formation of vesicles and scabs. The wool is likely to fall off and there is great itchiness.

TREATMENT.—In mild cases the affection disappears as soon as the rainy season is over. If this does not happen the parts should be dressed with Tincture of Creolin (page 343) or one of the ointments recommended for eczema in the dog.

Mud Fever.

This is really an eczema of the skin of the legs, flanks and abdomen of horses, arising from the irritation of mud and dirt or the application of cold water when the skin is in a heated or blood-flushed condition. The skin becomes harsh and dry and scurfy and pimples may form and be succeeded by scabs. The affection is seldom seen in horses whose legs are not clipped or washed.

TREATMENT.—A laxative drench (page 157) should be given and emollient dressings (oil and soda linament, page 338) applied.

Mallenders and Sallenders.

These are terms applied to an eczematous condition of the flexion surfaces of the knee and hock (the back of the knee and the front of the hock). They are often caused by want of care in the application of blisters in the region. In all cases of counter-irritants being applied to the limbs the skin of the bends or flexures of joints should be protected by smearing with vaseline or other greasy substance. On becoming established eczemas in these situations assume a special character and are more difficult to cure. The thickened skin on account of the movement to which the part is continually subject is formed into folds between which crevices or cracks occur. The edges of these cracks become inflamed and covered with dry scabs. The hair stands erect and often falls out. If not quickly healed the condition becomes chronic and a scaly exudate is continually formed or the trouble may develop into a localized "grease."

TREATMENT.—This will vary with the stage of the disease but as a rule the treatment recommended for "cracked heels" and for "grease" is successful.

Cracked Heels in Horses.

By cracked heels is understood an irritable and inflamed condition of the skin of the horse's heels. It is associated with heat, tenderness, and

cracks or crevices more or less severe, from which a serous fluid oozes, and dries as a scab or scurf on the borders of the cracks. This scurf, if allowed to accumulate, acts as a continual source of irritation, and prevents tne crack from healing.

CAUSES.—Coarse-haired and beefy-heeled horses have a constitutional tendency to this and allied affections, and their heels are always somewhat of a trouble to their owners. Another predisposing cause may be found in errors of diet—the use of mouldy or musty hay. Hard-feeding, too, without exercise, will cause a congestion of the skin of the heels which only needs the exciting cause of a little dirt, urine, or other irritating agent, to develop into cracked heels. Sometimes cracked heels are caused by the chafing of a tether rope or the ropes used in casting for operations. By far the most common cause, however, is the practice so much in favour with grooms of washing horses' legs. It is not so much the washing either, as the neglect to thoroughly dry the legs afterwards Except a good reaction is caused by drying with sponge and towel and hand-rubbing or bandaging, the skin of the heels, especially the hind ones, being so far removed from the centre of circulation, becomes cold and chilled, and slightly swollen and tender. On exercise the swollen skin bursts, as it were, and the cracks thus formed at the parts where the skin is most flexed; viz., in the niches at the back of the pastern. Another evil attendant upon washing is the use of soft soap, the lather of which, in addition to being difficult to wash off, is extremely irritating. Soft soap is made from potash, which is infinitely more caustic than soda, the basis of hard soap, so that hard soap only should be used. Equally essential is it that the heels should be rubbed *thoroughly dry*. On account of the great prevalence of cracked heels in white-legged horses, it has been contended that white skin is weaker and more easily inflamed than colored (pigmented) skin. It is more reasonable to assume, however, that this prevalence of cracked heels on white legs is the result of neglect after washing. For the sake of cleanliness and appearance, white legs are washed more often. They are thus more frequently exposed to the most common exciting cause.

TREATMENT.—The object to be aimed at is the abatement of the irritation, and for this purpose the scab or exudate which forms round the cracks should be removed with the fingers as often as it forms. An emollient or softening and healing ointment should be applied, not only after the day's work is over, but also before the horse starts his day's work in the morning. Lead liniment (Goulard's extract one part, olive oil eight parts) is a good application. Ordinary zinc ointment will relieve the irritable condition of the skin, and promote healing of the cracks. Zinc ointment with iodoform (one part to eight) is even better and more likely to effect a cure than most other agents, provided its use is combined with the recommendations before stated for prevention. When the cracked surface is raw or when the weeping is excessive some dry wound dressing should be applied (see page 156) and it is a good plan to alternate zinc oxide powder with an emollient ointment according as the cracks are moist or scabby. Stocking of the legs by hard feeding and want of exercise should be avoided.

Grease (Pustular Eczema).

Grease is an exaggerated condition of cracked heels extending beyond the hollow of the pastern and perhaps invading the skin as high as the knees and hocks or even above.

NATURE AND CAUSES.—Some horses appear to be constitutionally predisposed to grease and it mostly occurs in hairy-legged horses of the heavier breeds and in them the affection is much aggravated if, from lack of tone or want of exercise, the legs are allowed to become stocked. Given such a predisposition, the causes which have been described as likely to induce cracked heels in other horses, particularly prolonged exposure to wet and cold, will set up an attack of grease. A large part is played in the extension of the disease by the irritant moisture which exudes from the already affected surface as also by the accumulation of scurf and filth and by the splashing of urine in stables with insanitary floors. Indeed, grease may be aptly described as a typical local filth disease. The clipping of the hair at the back of the fetlock and pastern predisposes to grease, as when this is done the natural protection for the skin is removed and exposure to cold, damp and dirt is brought about. In some cases the skin becomes enormously thickened and warts form in abundance all over the affected surface (grapy grease). The affected parts may suppurate and the discharge is usually very foul and sickening.

TREATMENT.—In mild cases the treatment recommended for cracked heels may be effected, when there is much hair the dressing of the part thoroughly with an ointment is a tedious matter and astringent lotions or liniments (see page 194) are more likely to be effected. If the discharge is foul the parts should be washed with hard soap lather and some disinfectant such as Condy's fluid applied before the healing dressing is put on.

Treatment often necessarily extends over a long period and it is found advantageous for the dressing to be changed every few days. That this may be done the following list of dressings is given :—

Tincture of Creosote (1 part creosote to 6 methylated spirit).
Strong Tincture of Creolin (1 part creolin to 6 methylated spirit).
Tincture of Sulphuric acid (1 part acid to 15 methylated spirit).
Solution Chromic Acid (1 part acid to 9 methylated spirit).
White Lotion (see page 159).
Powdered Wattle Bark.
Oxide of Zinc and Powdered Starch, equal parts.
Oxide of Zinc and Powdered Charcoal, equal parts.

Warts or Angleberries.

The so-called warts or angleberries which affect horses and appear as nodulated masses on the skin of the inner aspect in the region of the thighs and arms, and on the nose and face are really fibroid tumours contained in a capsule out of which they may be easily "flipped" on incising with a sharp blade. In some cases on account of surface friction they become sore and ulcerated on the surface and the contained tumour or "kernel" becomes grown to the skin by productive inflammation. In these cases the most effective treatment is to tie a tight ligature round the base and allow them to slough off. When the base is diffuse so that it will not hold a ligature the growths may be removed by dissection with the knife or by the application of strong caustics or the hot searing iron.

SHEEP FEEDING.

H. W. Ham, Sheep Expert.

Although by the time this article is published the necessity for feeding sheep may be past, a few facts will, nevertheless, be of interest. It must be admitted that at intervals nothing is more certain to come than dry spells. One of the chief points in good management is to have a supply of fodder in some form or other; but it is equally important to commence feeding in time. With many who have the fodder by them the temptation is to hold off for rain, until forced to feed, and then it is a matter of feeding heavily.

Heavy feeding is always accompanied by a waste of fodder—early commencement means lighter feeding, and less waste. While there is a little natural feed about, be it ever so dry, there is something in between feeding times to keep the stock nibbling, and this allows of a lesser amounts of feed being given at a time, and for it to be cleaned up better.

Taking year in and year out, it is less expensive to make it a rule to commence feeding about a certain month each year, if it looks at all necessary, or to commence giving a little on the first signs of the stock failing in condition. If rain comes in its proper time, they repay the cost of labor and the fodder given. Should the rain keep off they are in all the better heart to face the dry spell, and if fodder gives out they are the stronger to travel; it is a costly matter while a dry spell is on to get sheep strong again, once they have been allowed to get low. It is a risky undertaking to attempt to remove weak sheep to any distance.

With flocks of sheep kept principally for wool-growing, feeding is always well repaid by commencing early. If the sheep are kept in fair order the growth of wool will be even and sound. The lower in condition they get the thinner the fibre grows, and when abundance of feed does come, they start away with a bolder growth, that causes an unevenness, if not a distinct break. In no class of sheep is early commencement of feeding so important as in merino lambing flocks. They are the earliest to lamb, fine comebacks being next, and crossbreds and pure British breeds later still. If ewes are kept strong through a bad time, it is surprising how they will keep their lambs going; some of the worst mothers will not have milk for their lambs, but many will pull them through, although it may not be a good rearing.

Dry spells do good in bringing home forcibly to many sheep men that it is very easy to get wrapped up in little points of detail as to quality and covering at classing time, and to forget shape of carcass—one of the principal guides to constitution, or ability to thrive.

Fine wool flocks, if allowed to get low in condition at the end of summer, and a dry autumn sets in, will grow a finer wool than usual; at the same time they secrete less yolk, and the fleece becomes what is termed "earthy." It is a dusty time of the year, and whether sheep are fed or not, the evil with dust exists. It is when wool is kept growing evenly and is of fair density with sufficient yolk to absorb and arrest the small particles of dust, that it is maintained in good order, for wool after all is valued for its usefulness when clean scoured.

Where sheep are being held over the summer with the view of fattening them in the winter, it pays well to have a supply of fodder for them. They often get so low in a bad autumn as to be past all chance of making them good enough until about shearing time, when, getting toward full fleece, it is next to impossible to make them prime, and so they have to be shorn; and by that time fat sheep are becoming plentiful and prices lower.

With the majority of sheep breeders who grow their own fodder, hay is the feed most in use, up to the present time. When necessary to buy feed, oats are most economical, and generally give the greatest satisfaction, for they contain the most nourishment in the smallest compass, are easily distributed, and give no trouble in windy weather.

Where lambing ewes are to be fed, silage is preferable to all other fodders. It has been proved that it will keep in the best of condition for an indefinite number of years. The objection to it with sheep men was that in the old style of rough ground pits, especially if not chaffed, it gradually rotted at the sides, for in good seasons it was made and sometimes kept for three and four years before being wanted. With the present day silos, when all matters of detail are properly carried out, this objection is not worth mentioning. Silage is also a good fodder to handle; it is heavy, and unlike hay-chaff, does not blow about. When stud ewes, or any special lambing flocks are to be fed with the view of saving the lambs and also keeping them growing well, the usual custom has been to feed chaff and bran. Unless it was well sheltered in the troughs the bran blew away in the wind, especially if the feeder were careless in emptying the bags and mixing. This is a serious disadvantage in bran and chaff feeding. If it is damped to keep it from the effects of the wind, and it is not all eaten, it soon becomes sour. Silage chaff, when mixed with hay chaff, is better to handle in the wind, and, whilst equal with bran for milk giving, is less costly.

For feeding hay at some distance, light spring drays and waggonettes with strong hurdles on each side and one across the end, with the front of the cart left open, will carry a lot of sheaves. The driver can tie the reins handy, and let his horse walk along, while he throws the hay off in a thin line. This thin line gives the weak sheep a chance to get their share, and they soon learn to follow the carts. If sheep are being fed for the first time, it is best to place the hay in a circle round them; they must then feed across it at some point, and once they taste it no further trouble will be found. Sheep run along and in a very quick time take the heads and lightest parts of the hay first. If a few head of cattle are allowed to run in the paddock, they will clean up the coarse straws. Where large flocks, especially on leasehold areas, have to be provided for, hay, when cut with the binder, is least expensive to make. Use oaten hay for preference. If short in the straw so much the better; many farmers when wanting hay for their own use check the crop with a few stud sheep, or fatten off a few on it if it shows at all forward in the winter. Algerian sheaves about two feet in length form an ideal feed for all stock. When intending to sell to produce merchants it is another matter—a coarser sheaf will cut a more showy sample of chaff.

When sheep are too long forced to eating grass and tussocks of perhaps two years' standing, or living on bits of dead grass from out of the dust, they sooner or later die of impaction, especially so if the water is

bad, and this unfortunately is the case in most instances, and often necessitates the overstocking of paddocks where good water exists. A little hay three times a week, and coarse salt (laid out in the bags it is bought in, with the upper side cut open) help in digesting the old grass, &c., eaten between feeding times. If the sheep show signs of being very bad, Epsom salts mixed in with the salt and re-bagged up, help still more. If sheep have had no previous knowledge of salt, sow some broadcast around the spot where the salt bags are, and they will find it when feeding. Loose coarse salt, known sometimes as agricultural salt, allows of the weak sheep running off with a mouthful when driven away by the stronger ones. Like the feeding, salt must be commenced early to give it justice; when sheep get low in condition a lot of feed is necessary to improve them, and so it is with salt. If impaction has already commenced, it may take so strong a mixture of Epsom salts that the sheep will refuse it. The healthiest of sheep will never refuse salt after once getting to know it.

One thing in favor of districts where the worst time for the stock is the autumn, is, that the ground is then dry and the nights warm, whilst in districts where the worst time is the end of winter, to feed outside to any quantity of stock, means a greater waste of feed through rain and trampling in the mud, and takes more feed to do the same amount of good.

A SMALL FARMER'S WOOLPRESS.

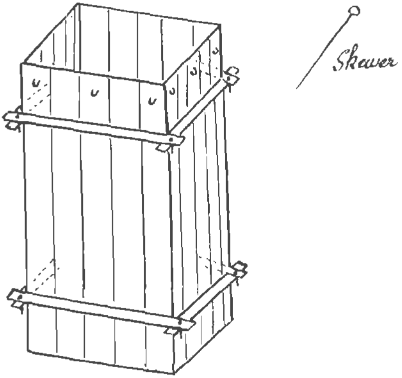
H. W. Ham, Sheep Expert.

Many farmers with small lamb-raising flocks hang up a pack at shearing time to the cross beams of a shed and stamp the wool into it. Wool men call such bales "sew-downs," and expect on opening them to find things inside just as irregular and bad looking as the outside appears. These sew-downs have acquired a bad name, for in them as a rule are found mixed grades of fleeces mostly with stains and dirty and burry pieces left on. Some strange tales are told in wool circles of false packing and rubbish found in this class of bale, such as dead sheep, stones, eggs, bird droppings, string, straw, &c. A handy, inexpensive press is necessary for small farmers who wish to take any pride in keeping all classes of their clip separate, even if three or four sorts are put in the one bale, as described in the January *Journal.*

With the box press shown in the accompanying sketch, the objection may be raised that enough cannot be got into it, and that a farmer would be put to more cost for packs than if sew-downs were used. One thing to be remembered is that star lots are to be avoided as much as possible. If a farmer has a fairly even line of wool in two very heavy sew-downs, or three medium ones, it would pay him better, had he made four lighter ones, for then his wool would appear in the main sales. With the press illustrated, bales are squarer and neater and not so long. From 2 to 3 cwt. can be pressed in with a spade, and even a bale of 1½ cwt. will look neat and attractive. It is not desirable to put so much wool into bales as was at one time thought necessary. The custom is towards lightly pressed bales of from 200 to 300 lbs. each, except in the case of lower classes of pieces and very heavy bales of these are against sellers' interests.

The press can be made by any farmer, and is a suitable in-door job for wet days. The measurements are 4 feet 6 inches high, and 2 feet 2 inches square, clear inside measurement, (two sides will need to be made 2 feet 4 inches to bring all the sides to 2 feet 2 inches inside). The side pieces are of ordinary hard-wood, 3 feet 1 inch long; 6 x 1 can be used for the sides, and 3 x 2 for the side pieces. Old bolts are used in each corner.

The pack should be put in with the corners about four inches from the ground, and the centre of the bottom of the pack touching the floor. The staples are necessary so that a wire skewer made of No. 6 fencing wire, and sharpened, can be run through the pack and the staple, into the pack again, through the next staple and so on, no cutting of the pack



A SMALL FARMER'S WOOLPRESS.

being required. When the bale is full the skewers are withdrawn and the slack of the cap is tucked under, pulled over, and drawn tightly with a centre four-ply stitch; two bolts can then be taken out, and the bale released and sewn up neatly. The staples should be two inches from the top of the press, and made of No. 8 wire driven in and turned up inside, through holes bored only large enough to allow the wire to fit exactly.

The measurements of a wool-pack are 4 feet 6 inches x 2 feet 3 inches x 2 feet 4 inches, and the box being made a little smaller causes a squarer bale. It is necessary to well fill the corners of the pack when commencing.

THE ELEMENTS OF ANIMAL PHYSIOLOGY.

(*Continued from page* 266.)

W. A. Osborne, M.B., D.Sc., Professor of Physiology and Histology, Dean of the Faculty of Agriculture in the University of Melbourne.

XI. The Blood.

The blood is a red opaque fluid which circulates through a system of tubes called blood vessels. Its functions are—

1. To carry oxygen and nutriment to the tissues.
2. To carry carbon dioxide and waste products from the tissues.
3. To distribute heat, equalizing it through the inner organs and preventing local or general rise of temperature.
4. To carry chemical messengers or hormones from organ to organ.
5. To resist the attacks of bacterial parasites and to neutralize their poisons.

The blood consists primarily of a straw-coloured, transparent fluid called PLASMA in which are suspended structures called CORPUSCLES. The plasma occupies about two thirds of the volume of the blood and consists chiefly of water namely about 90 per cent. Of the solids present proteins, in the form of albumens and globulins make up about 8 per cent. Small amounts of sugar and fat can also be detected and traces of waste matter such as urea, uric acid, &c. The mineral ingredients, constituting about 0.9 per cent, are made up of chlorides, phosphates and bicarbonates of soda, potash, lime and magnesia. The metals with which these acids are combined are present in a constant proportion, nearly the same proportion that exists in sea water, and their importance is considerable. An organ, say the heart, loop of bowel, uterus, &c., cut out of a recently-killed animal, can be kept alive and maintained in an active condition for many hours if a solution of these salts, in the proper proportion, is pumped through its vessels. Water alone or any watery solutions containing other than the correct concentration and proportion of these salts will speedily cause the death of the organ.

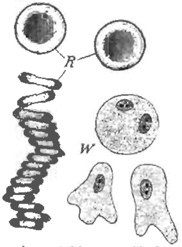


Fig. 49 Blood corpuscles, highly magnified; R., red; W., white. (After Hagemann.)

The corpuscles are of two kinds red and white. The RED CORPUSCLES are tough, elastic discs of microscopic size. Viewed from one aspect they

appear circular, but looked at end-on they are dumb-bell shaped. Mammalian corpuscles do not possess nuclei and cannot be regarded as living; in fact there is evidence to show that they are continually being broken down and replaced by fresh ones in the marrow of certain bones. Their size (diameter of the disc) varies slightly with different mammals and probably also in the same species. The following table gives approximately the diameter of a number of types:—

Man	$\frac{1}{3200}$ inch.
Dog	$\frac{1}{3500}$,,
Pig and Ox	$\frac{1}{4200}$,,
Horse	$\frac{1}{4500}$,,
Sheep	$\frac{1}{5200}$,,

The number of corpuscles present is usually stated in terms of the number present in a cubic millimetre* of blood. Thus—

Horse, 6,500,000,— 8,000,000 corpuscles per cubic millimetre.

Man, ox, pig and dog, about 5,000,000 corpuscles per cubic millimetre.

Goat, 9,000,000 — 10,000,000 corpuscles per cubic millimetre.

The red corpuscles are composed of an external envelope of lipoid within which is a meshwork of protein holding in its spaces the red colouring matter of the blood or *hæmoglobin* which constitutes over 30 per cent. of the weight of the corpuscle. Hæmoglobin is a complex protein containing iron, and seems to be present in the body for the sole purpose of carrying the oxygen and part of the carbon dioxide. The red corpuscle may therefore be looked on as a boat for the transfer of the two blood gases, and this property it possesses through its hæmoglobin content. When hæmoglobin is linked to oxygen, forming *oxyhæmoglobin*, its colour is bright red; if uncombined with oxygen (simple *hæmoglobin*) its colour is bluish-purple. Hence the blood leaving the lung and that in the arteries (arterial blood) is red, whilst that leaving the tissues (venous blood) is bluish-purple. When red corpuscles are placed in water or in a salt solution of less than the proper concentration, they swell up and burst, liberating the hæmoglobin into the plasma. If placed in a salt solution stronger than the blood they shrink and crinkle at the edges. Anything which dissolves or breaks up lipoid (chloroform, ether, &c., and certain toxic enzymes) will destroy the integrity of the corpuscle and liberate the hæmoglobin; and it is important to note that hæmoglobin, thus liberated, acts as a foreign body, is incapable of carrying the gases properly, and is promptly turned out of the blood by the kidney. The red corpuscles, as has been stated, are elastic. They pass with ease through the pores of fine filter-paper and can be forced through tubes or apertures of smaller calibre than their diameters.

The WHITE CORPUSCLES, unlike the red, are nucleated living cells, some of which move to and fro in the plasma and are capable of passing through the walls of the smallest blood-vessel. The number of white cells is much less than that of the red; in man, for one white. 500 to 600 red can generally be found. There are several varieties of white corpuscles, and it is probable that they may have different functions. The most numerous sort are endowed with the power of attacking and digesting bacteria just as an amœba can digest a particle of food. If bacteria get lodged in a tissue the white cells throng to the spot and a fight for life or death ensues. What is known as pus or matter is most probably a collection of white cells which have been exhausted if not killed in the struggle. This contest between the white cells and intruding bacteria is

* A cubic millimetre is approximately one-fiftieth of the volume of a drop of water.

probably in constant operation. It is only when bacteria get temporarily the upper hand that inflammation, with all its signs and symptoms, takes place. These white cells can not only digest bacteria but they can also eat away and remove small blood-clots and small portions of tissue that have died through injury or stoppage of the circulation. White cells undoubtedly play some part in digestion as their number is always increased after a meal. That they can carry fat globules from the surface cells of the villus into the central lacteal is undoubted; probably they help also in the absorption and rebuilding of proteins and carbohydrates.

Both varieties of corpuscles are slightly denser than the plasma in which they float. If blood be kept in a vessel and prevented from clotting the corpuscles will sink by gravity; this action can be hastened by the centrifuge, an instrument on the same principle as the cream separator, only that in this instance the corpuscles, unlike the cream, are slung outwards.

THE CLOTTING OF BLOOD. — The spontaneous coagulation or clotting of blood serves as a natural means of arresting hæmorrhage. Were it not for this property, a small and unperceived cut would continue to bleed until death resulted. The essential change in blood clotting is a transformation of a soluble globulin called *fibrinogen*, which exists in a small amount in the plasma, into an insoluble, stringy substance, *fibrin*. When blood clots as a whole the fibrin meshwork entangles the corpuscles so that the clot consists of fibrin and corpuscles together. Such a clot at first extends over the whole mass of blood affected, but very soon a clear fluid will be seen exuding from the clot; this fluid is *serum* and is really plasma bereft of its fibrinogen. If, while blood is clotting, it is stirred briskly with a bunch of feathers, the fibrin is collected into a mass and does not entangle the corpuscles. Such blood is called *defibrinated blood* and when it is centrifuged or allowed to settle it separates into corpuscles and *serum*. If blood be separated into plasma and corpuscles before clotting has taken place, then the clot will form in the plasma and of course will contain no corpuscles.

The change of fibrinogen into fibrin is conditional on the presence of an enzyme called *fibrin ferment*. But this enzyme does not occur as such in the blood. It is there in an inactive form called *thrombogen*. Now before thrombogen can change into fibrin ferment, two conditions must be fulfilled —firstly there must be *lime salts* present and secondly there must be a substance called *kinase* which is produced whenever a tissue is torn. The interaction of these factors can be given in a simple diagram.

Kinase .. .	}	
Thrombogen ...	} fibrin ferment ...	} fibrin or clot
Lime salts ..	} fibrinogen ...	}

The coagulation of blood may be prevented or delayed by cold, which depresses all chemical change; and further by the removal of any of the precursors of fibrin. A favourite method is to add to blood, as soon as it is shed, some sodium oxalate or sodium citrate which removes the lime. Such blood can be centrifuged and plasma obtained from it. On adding to this blood, or its plasma, sufficient lime salts, *e.g.*, calcium chloride, a clot forms very quickly. Leeches prevent clotting around the point of their puncture by destroying the thrombogen, some snake venoms prevent clotting by destroying the kinase. If blood be received into a vessel smeared with oil or paraffin, clotting is greatly delayed; the reason for this is not clearly understood.

IMMUNITY.—Whenever a cell, a protein, or a ferment, foreign to the body, enters the blood, it provokes the formation of a neutralizing or antagonistic substance. The exact site of origin of these substances is not fully understood, one school regarding the white cells as the sole source, another school asserting that the tissues affected by the foreign substance supply the antibody. These antagonistic substances are of various sorts and can be briefly enumerated as follows:—

1. Foreign proteins excite the formation of *precipitins*, which when mixed with the exciting protein produce precipitates. Thus if white of egg is injected several times into a rabbit the blood of this animal will contain a precipitin which can readily be demonstrated by mixing egg white with the rabbit's serum. These precipitins like all the other antibodies are fairly specific. For instance the precipitin evoked by the albumen of a hen's egg will give a well defined precipitate with the white of a hen's egg but none or hardly any with the white of a duck's egg. The proteins of man's blood will excite in the same way a precipitin which reacts best with a protein derived from a man or anthropoid ape.
2. Enzymes excite the formation of *antienzymes*. Even the digestive ferments in the alimentary canal of an animal provoke in the same animal the formation of antitrypsin, &c., which fact partly explains why these digestive ferments act only on the food and not on the lining walls of the gut.
3. The toxins which bacteria produce and which can gain admittance to the general circulation, giving rise to various disturbances, excite the formation of *antitoxins* which neutralise these bacterial products.
4. Foreign cells, including bacteria and foreign blood corpuscles, excite the formation of a number of antagonistic bodies—
   - (*a*) *Agglutinins*, which cause the foreign cells to clump together.
   - (*b*) *Opsonins* which so act upon bacteria, &c., that these latter are readily devoured by white cells.
   - (*c*) *Cytotoxins* which break up the cell-wall and cause disintegration of the cell. Thus the red copuscles of a sheep, injected into a rabbit, will be followed by the formation in the rabbit of a substance which destroys the envelope of the red corpuscles of the sheep and acts only in a feeble manner on the red corpuscles of other animals.

When an animal acquires a disease and, after its recovery, is no longer liable to contract the same disease, as occurs, for instance, with typhoid fever in man and distemper in dogs, the immunity acquired is explained by assuming that these antibodies, formed during the disease, remain in the circulation and effectually prevent each new invasion from making any headway. No substances simpler than the proteins or the enzymes appear capable of exciting the formation of antibodies; thus *ricin*, the poisonous protein of castor-oil seeds, causes the production of antiricin, but alkaloids such as morphia or strychnine or other and simpler substances cannot act in this way.

The total amount of blood in the body is about one-fifteenth to one-twentieth of the total weight of the animal.

The specific gravity of the blood is about 1056, that is to say 1056 volumes of pure water would weigh the same as 1000 volumes of blood.

The reaction of the blood is that of pure water, namely, neutral.

The freezing point of blood also remains wonderfully constant, namely 0.56 C. below that of water for mammalian blood.

THE PROCLAIMED PLANTS OF VICTORIA.

(Continued from page 272.)

Alfred J. Ewart, D.Sc., Ph.D., F.L.S., Government Botanist; and J. R. Tovey, Herbarium Assistant.

The Drooping or Common Prickly Pear.

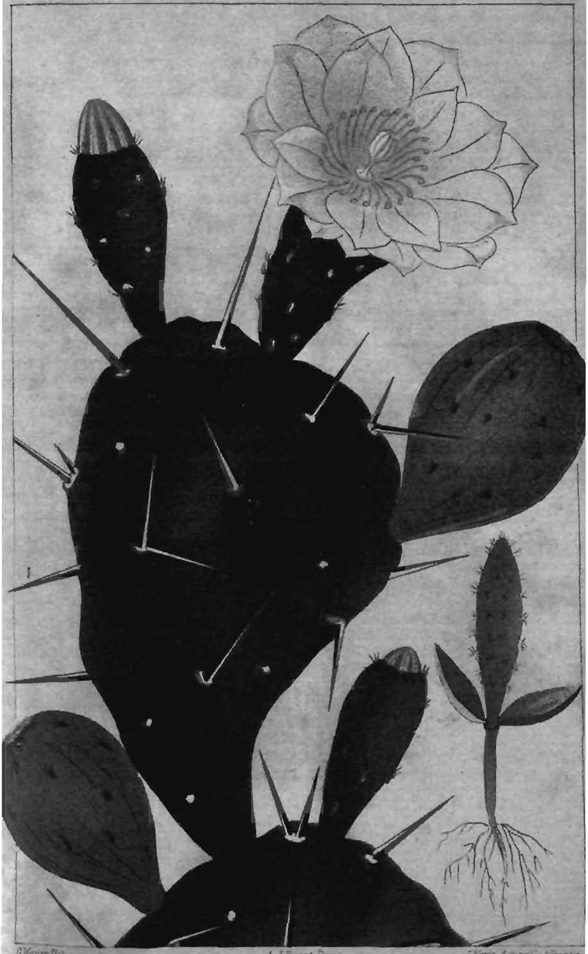
Opuntia monacantha, Haw.

The spines of the Drooping or Common Prickly Pear are mostly single, but often in pairs, and then frequently sharply bent at their bases, so that one or both diverge widely. Occasionally more than two large spines occur together. The spines arise from more or less prominent cushions, which often bear bundles of minute hair-like spines, especially well shown on the fruits. The joints are obovate-oblong, often a foot long, usually distinctly stalked, the whole plant 3 to exceptionally over 12 feet in height but usually 5 to 8 feet. The flowers are yellow, the outer petals reddish, the fruits pear-shaped and clustered on the usually more or less drooping ends of branches. Every joint will strike root under favorable conditions, and both the ripe and unripe fruits will do the same. The joints may remain alive several months after cutting. They can be destroyed by boiling, and may then be fed to stock if care is taken to see that the spines, especially the smaller ones, have come away. It is not, however, good food, being too bulky and watery. Otherwise it can be buried in pits and covered with soil, or piled in heaps and covered with quick lime. In South Africa spraying with arsenite of soda is recommended (2½ to 4 per cent. solution), but this is costly (probably £3 to £5 per acre in Victoria), and the plants need to be burnt off as soon as they have dried and before new shoots appear. Spraying the standing plants with dilute sulphuric acid in calm, dry weather is also fairly effective but less so than cutting.

This plant appears to be increasing in Victoria, and is spreading along the railways around the shores of Port Phillip Bay, where it is likely to prove a great nuisance or even danger if unchecked. The plant would without doubt do great harm in the Mallee district if allowed to spread there. Several other less common species grow in Australia, and an account of them has been given by Maiden in the *Agricultural Gazette for New South Wales*, Vol. IX., p. 1002, 1899.

Proclaimed for the whole State, February, 1907.

PLATE 25.



A. J. Ewart Direx.

DROOPING PRICKLY PEAR.

(*Opuntia monacantha*, Haw.)

FOURTH PROGRESS REPORT ON VITICULTURE IN EUROPE.

(*Continued from page 320.*)

F. de Castella.

Reconstitution in Spain.

The Jerez or Sherry District (*continued*).

RESISTANCE TO PHYLLOXERA OF VINIFERA-AMERICANS.

This has long been considered an uncertain quantity and from the time of their first use on a large scale caution was recommended by leading French authorities whose study of the action of phylloxera on the rootlets of these vines grown in pots and their microscopical observations of the lesions caused by the insect led them to doubt the permanency of their resistance. These fears do not appear to have been justified by events and it is in this connection that the experience of Jerez is perhaps most interesting to us, for its soils, especially those of the Afuera type, are ones in which the action of phylloxera is most severely felt and those where the death of the vines occurred within a remarkably short time after the first appearance of the insect.

Both the soil and climate of Jerez are such as to lead one to conclude that if the resistance of these hybrids were to prove insufficient anywhere it would be here, and yet after their use on a large scale for over ten years they have given entire satisfaction in all but a very few soils, and in these trouble was not due to want of resistance to phylloxera.

Further evidence that the resistance of the best of these stocks is sufficient for all practical purposes was afforded at the International Viticultural Congress held at Angers last July, where one of the Spanish delegates, Don Nicolas Garcia de Los Salomones, asked all the assembled delegates to inform the Congress "if after nearly twenty years during which these (Franco-American) hybrids have been everywhere experimented with, there has, to their knowledge, occurred a well marked case of injury by phylloxera." A very interesting discussion resulted, in which several of the leading authorities took part. The good qualities of the best known Franco-Americans were further emphasised and of the numerous members present, including delegates from all the leading vine countries of the world, not one rose to impugn the resistance of the Franco-Americans of proved value. The popularity of these stocks seems to be abundantly justified and the success which has followed their use in the warmer and drier parts of Spain augurs well for a great future for them with us.

BENCH GRAFTING OR VINEYARD GRAFTING.—In Southern Spain, as also in Portugal, bench grafting is seldom practised. It has been tried by several proprietors and is recommended by most of those whose viticultural knowledge is derived from French sources, but the great majority—practically the totality of the vineyards of Jerez—are reconstituted by means of vineyard grafting. Their proprietors hold very pronounced views on the question and all those met with were strongly in favor of the vineyard graft. At Castello de Macharnudo, comparative experiments on a large scale have been carried out and, although plots reconstituted by

means of nursery raised bench grafts were doing well, any one accustomed to vineyard work could see that the vineyard grafts were on the whole more satisfactory and quite as regular; for in these warm southern districts, the graft succeeds far more regularly than in the colder climate of even Southern France where want of regularity in the vineyard is the chief argument against vineyard grafting. I carefully examined a good many of the vines and could find no fault with the unions obtained by means of vineyard grafting. In colder climates, this method is said to give many faulty unions but in the warm south the vigorous growth which shortly follows the knitting of stock and scion seems to result in a complete and almost always faultless union.

Jerez vineyard proprietors and managers hold that a vineyard grafted vine comes to full bearing a year or two earlier than a bench grafted nursery raised one even though the latter were planted at the same time as the ungrafted American rootling which was to be subsequently grafted. They point out that the roots formed in the nursery are of little use and die off, their place being filled by entirely new roots thrown out from the base of what was the original cutting subsequent to its replantation. One partisan of vineyard grafting pertinently remarked that it was more logical to allow the young vine to make its roots the first year and its union the second as it was then in a better position to make a perfect union. If both had to be made simultaneously the work would be much less perfectly done as the sap necessary for the elaboration, both of roots and union, would have the obstacle of the restriction presented by the graft, whereas if the roots were already thoroughly established, the strong flow of sap would enable this to adapt itself rapidly to any calls that might be made on it.

The fine vineyards of Gonzalez Byass & Co., such as Tula, Matamoros, &c., have all been reconstituted in this way and so far as regularity and vigour leave nothing to be desired.

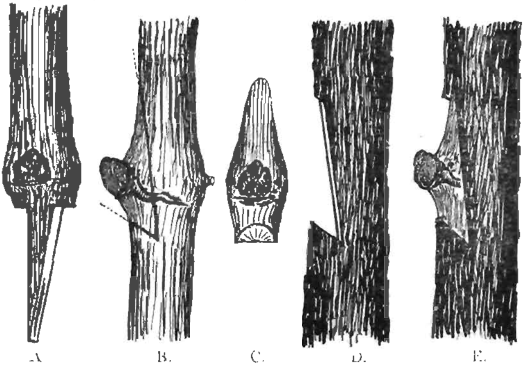
Another argument in favor of the vineyard graft is the fact that in the dry climate of Jerez a very long rooted plant appears to be necessary so that, when first planted, its roots may be sufficiently deep to survive drought. It does not appear to be practicable to successfully rear bench grafts of the length which is considered necessary for "barbados" as the rooted ungrafted Americans are termed.

I inquired into the matter very completely in Spain as the popularity of the vineyard graft in Portugal came rather as a surprise to me. I consider that there must be good reasons for the contentions of these vineyard proprietors who show so strongly a preference for vineyard grafting both in Southern Spain and Portugal. It is true that in Northern Spain where climatic conditions are more similar to those prevailing in France, bench grafting is largely displacing vineyard grafting, especially now that callusing methods have been considerably improved, thus permitting a higher percentage of successful unions to be obtained. In Northern Spain the French moss callusing system, invented by M. F. Richter of Montpellier, may be said to have revolutionized the production of nursery raised bench grafts, but in our warm climate, so similar to that of Southern Spain, it is highly probable that vineyard grafting, if properly executed, will prove of great use.

Grafting Methods.

Bench grafting is so little practised in Jerez that we need not consider the methods used. In the vineyard the vines are grafted by two quite

distinct methods. The first, known as *Espiga*, is none other than the ordinary cleft, early spring graft, more or less modified, according to the views of the vineyard proprietor. Frequently the scion is cut to a shouldered wedge. I was rather astonished to see them prepared with an ordinary knife and not with a special machine. The fact that the sections are not plane surfaces does not seem to lead to the unsatisfactory results one might expect. The advantages of the shouldered cleft are twofold: the sections of the cambium layer are straight lines instead of curved ones; this enables their being placed in contact with those of the stock along a greater length. Then, again, the wedge being narrower, the sides of the cleft are not separated so widely as to leave a gap below the end of the scion as is apt to happen with ordinary cleft grafting if the scions are strong. The scion is usually cut in such a way that the apex of the wedge shall be rather to one side of the axis of the cane; in this way it consists of solid wood and is to one side of the pith. See Figure A in the accompanying diagram. Both the ordinary cleft and the shouldered wedge graft seem to give good results—each system has its partisans. As in Portugal, the time for grafting is earlier than that usually recommended. February (August, in Australia) is looked upon as the best month, but much grafting is done in January.



A. B. C. D. E.

GRAFTING METHODS.

A. Lower portion of scion cut for *Espiga* graft.
B. and C. Removal of bud for *Yema* graft.
D. Stock ready to receive bud of *Yema* graft.
E. *Yema* graft completed and ready for binding with raffia.

The second method is known as *Yema*. It is a summer bud graft and was quite new to me both as regards method and season for execution. It is a true graft and not a form of budding in the sense in which we usually understand it, for the bud is removed together with a fair sized fragment of the already woody shoot of the current year's growth. The stock is prepared to receive it by the removal of a similar shaped piece of

wood by means of four cuts of the grafting knife: into the gap thus made, which reaches nearly to the centre of the cane, the properly cut eye is carefully fitted and securely bound with raffia. Care must be taken in fitting the bud into its place that the cambium layers of stock and scion correspond as accurately as possible. When tying, the raffia must first be placed over the bud and bound round and below it so as to insure thorough contact at the base of the graft.

This graft is best suited for cases where there is but slight difference in diameter between stock and scion, as is the case when a one or two year old rooted vine is grafted in the vineyard. The upper part of the stock is not cut off but continues its growth, the flow of sap which is then maintained enabling the union to take place under most favorable conditions. The graft knits but the bud remains dormant until the following spring when it makes very vigorous growth.

August is the best month for the execution of this graft in Spain. This corresponds to February in Victoria; a convenient time, falling, as it does, between harvest and vintage. As soon as the young shoots of the current year are sufficiently lignified to provide a properly ripened bud the operation may be performed. The bud is grafted on at about the level of the ground which is then heaped up around it into a high mound to protect it from changes of temperature and desiccation.

This graft practically gives the vigneron "two strings to his bow." When the time for ordinary or "Espiga" grafting comes round (early spring) it is possible to see if the bud has taken or if it is dead; in the latter case the stock is cut off half an inch below the bud graft and regrafted in the ordinary way.

The unions obtained by means of this graft in southern Spain are really magnificent, though I have heard that they are less perfect in cooler climates. I was much struck by the regularity of the vines and the perfection of the union on a large block of 3 year old vines reconstituted in this way at the Castello de Macharnudo.

At the well known Tula vineyard of Messrs. Gonzalez, Byass, and Coy., this style of grafting is in great favor. "*Espiga ne vale nada*" (The espiga graft is no good) said the *Capataz* (overseer) of Tula to me. He assured me that with the *Yema* a larger percentage succeeded and that the unions were more perfect. I have collected full information concerning this interesting graft and feel sure that it is at least worth a careful trial in the warmer parts of Victoria where climatic conditions are so similar to those of Andalucia, and where the perfect union it gives will no doubt render it popular.

SUBSOILING AND ESTABLISHMENT OF THE VINEYARD.

Subsoiling is looked upon as an absolutely indispensable operation. It is carried out by hand to a depth of from 2 to 3 feet. I saw one case of a replanted vineyard subsoiled 2 feet deep where the owner complained that the vines had suffered from last season's drought more than they would have had the trenching been deeper.

Trenching is usually performed in summer, especially where spear grass is prevalent as it is then destroyed by exposure to the hot sun. Subsoil and surface are mixed thoroughly. In most of the viticultural districts of Europe I visited, I was struck by the fact that this is the usual procedure—and by its strong contrast to our Victorian experience, where the stirring of the top different layers of soil to a depth of a

couple of feet without interfering with their relative positions has always been found the most satisfactory system.

This marked difference is no doubt largely accounted for by difference in geological formation—primary soils, as well as those of more recent age resulting from the decompositions of primary rocks, constitute the vast majority of the soils of Victoria, and these are only rarely to be met with in Spain or in fact in Europe generally. Then again it must be remembered that there is a great difference between our virgin soils which have remained as nature left them, and the soils of Europe which have for countless generations been handled and worked to a considerable depth; for the need of subsoiling is not a new idea in Europe but one which has been constantly advocated and practised since the times of the earliest agricultural writers.

The distance apart varies somewhat from vineyard to vineyard. I have seen vines planted at 5 x 5, at 3 ft. 3 in. x 6 ft. 6 in., and at 4 x 4. This would mean from 1,700 to 2,700 vines per acre. In pre-phylloxera times, vines were planted considerably closer—about double this number per acre. That this distance should be so much closer than that found most suitable in northern Victoria, under similar climatic conditions, suggests the question whether, with the deeper preliminary cultivation we are now adopting in Victoria, we may not find it advisable to plant our vines somewhat closer than formerly. The question is an important one which can only be properly answered by means of carefully conducted experimental plots.

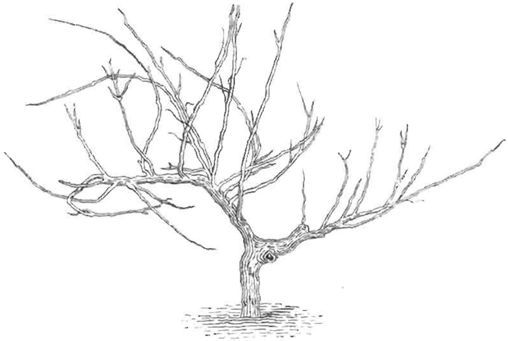
Nursery struck rooted vines are, as has been said, almost invariably planted. These *Barbados* as they are called are never less than 18 inches long and sometimes even more. They are grafted, as a rule, the year following their plantation, but, if owing to the season having been an unfavorable one, growth is not considered sufficient they are allowed to remain ungrafted for another year. I have known cases where a vineyard was established by planting American cuttings in February. These had made sufficient growth to enable them to be grafted the following August. An excellent result was obtained. This was in an exceptional season, however, and such favorable conditions do not usually prevail. Water is scarce in Jerez and irrigation is not possible. Plantation with "Barbados" is the general rule.

TRAINING AND PRUNING.

The vines of Jerez are formed with low crowns; they are usually pruned to one rod and one or two spurs, though strong vines may be allowed two rods. In the Afuera soils one rod is the rule. The vines are not staked or tied up in any way during the summer nor are the rods tied to wires. These are supported at their extremities by small wooden forks named "*horquillas*" driven into the ground and in this way the fruit is kept off the ground. In some vineyards the regular *Guyot* method of pruning is applied, the vines being formed with two arms, each of which bears a rod and a spur arranged in the usual well known way. This system is a rather recent introduction and differs radically from the old method of the district, the guiding principle of which was that the rod should not be borne by the same arm for two years in succession. It is claimed that in this way the arm, on which the rod has been suppressed, is made to throw out strong shoots which will be available to choose a rod from the following year, and that exhaustion of the vine by long pruning is thus avoided. The contention seems logical, but both methods of pruning appear to give satisfactory results.

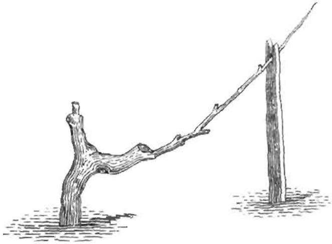
VARIETIES CULTIVATED.

These can be more appropriately dealt with in connexion with wine making in this district to which I am devoting a separate report, but the chief varieties may be briefly enumerated here.



JEREZ VINE BEFORE PRUNING.

First we have the *Palomino*, which is by far the most important cepage constituting at least four-fifths of all the best vineyards. *Pedro Ximenes* is found in a smaller proportion on many good vineyards. A little of this variety is often blended in with Palomino, but it is usually made separately into the very sweet wine known by the name of the vine and used for blending purposes. These are the chief varieties met with in the celebrated vineyards of the Afuera soils. In the Arenas and Barros several other



THE SAME VINE, PRUNED.

sorts are to be found as well such as Cañocazo, Castellano, Mantuo de Pila and Mantuo Castellano, Beba, Calon, Uva de Rey, Perruno, Mollar, &c. But the Palomino is pre-eminently the leading sherry grape.

CULTURAL METHODS.

Nowhere in Spain did I see the soil of the vineyards better worked than at Jerez. The culture in other parts is based on the same principles and the different operations are known by much the same terms, but it is in Jerez that they are most thoroughly and carefully carried out. A brief description of the series of operations by which the soil is worked is thus of interest.

In the first place, all cultural operations are performed by hand with the hoe. In Jerez, no vineyards are worked by animal traction. The hoes are large and heavy and vary somewhat in form, according to the work and the season. The handle is short and fixed so as to make rather an acute angle with the blade. The knack possessed by the average vineyard labourer is truly surprising. He is able to turn over a large quantity of ground in a remarkably short time. To see a gang of vignerons at work at the first or principal hoeing is a most interesting sight, and one not easily forgotten. Each man knows exactly how to use his implement to best advantage, not only without interfering with the work of his neighbour, but so as to fit in with and complete it. After driving the hoe into the ground instead of drawing it and its load of earth forward in the way we do when hoeing, it is turned sideways the soil being thus as efficiently turned as with a spade though the operation appears queer to a visitor. The short handles and the much back-bending they necessitate also strike one as unusual but, after watching a gang of vignerons carrying out the first winter cultivation for some time on one of the large vineyards, I was much struck by the amount of ground got over and the thorough way in which the work was done, apparently with a minimum of effort.

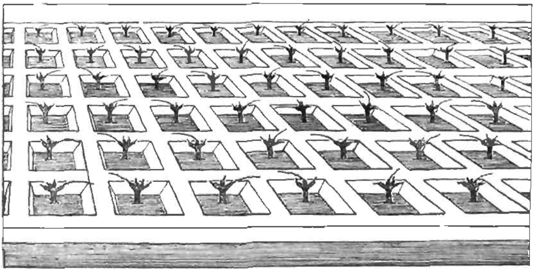


DIAGRAM SHOWING APPEARANCE OF VINEYARD WORKED INTO PILETAS.

Four or five cultural operations are performed during the year. The first or winter cultivation is naturally the most important. It is performed in three distinct ways, according to circumstances, to each of which a different Spanish term is given.

Chata is the term for the thorough working of the soil which is entirely turned to a depth of some 9 inches, and at the same time gathered into ridges between the vines so that after its completion each vine is surrounded by an embankment about 1 foot in height and occupies the centre

of the square basin enclosed by it. These basins are known as "*Piletas.*" The appearance of a vineyard when worked into piletas is very striking. I have endeavoured to represent it in the accompanying diagram. This system presents the great advantage of insuring the absorption of any rain which falls after its execution—an important one in such a dry climate as that of Jerez. When executing the Chata the ground is first turned over in the interval between the vines where the ridges are subsequently formed by drawing the earth from immediately around them. This differentiates it from the second method known as "*Serpia*" which is only a partial working, the ground under the ridges not being turned over. In outward appearance there is little or no difference between the two, the vineyard being worked into Piletas in the same way as by the Chata method. On some vineyards the Chata is performed one season and Serpia the second, the latter system costing considerably less labour to execute. "*Alomado*" is the term given to the third method. The ground is completely worked and drawn up into long ridges between the rows in one direction only. This method is frequently used on level land, and also after an exceedingly wet autumn which has thoroughly saturated the sub soil, in which case it may even be considered advisable to allow portion of any subsequent rainfall to run off without soaking into the soil. The winter cultivation, according to one or other of these three modes, is performed about the months of November and December. It is sometimes commenced—especially Chata or Serpia—in a very dry autumn soon after vintage, in order to collect and store in the subsoil as much rainwater as possible.

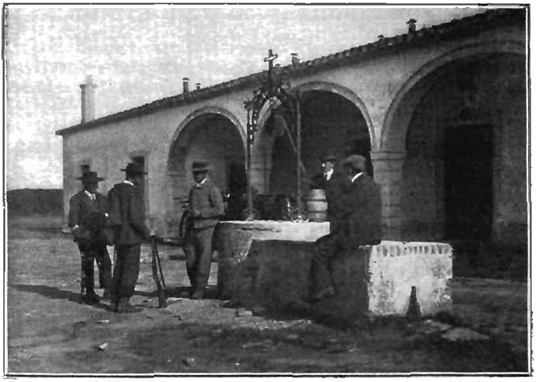
The second cultivation known as *Cavabien* is performed about the month of February. The Piletas are hoed down and the surface of the vineyard left level though rough. It is done about the season for "Espiga" grafting and high mounds are formed if there are any newly executed grafts to protect. "*Golpe Lleno*" (full cut) is the third cultivation in April or May. It is an ordinary hoeing which leaves the land level and in as fine a state of division as possible. The last cultivations are very superficial hoeings known as "*Vina*" or "*Bina.*" Weeds are cut and the ground left as smooth as possible by tapping it with the flat of the hoe. Great importance is attached to this tapping, the chief object of which is to close any cracks which may have formed, for the soil of Jerez —especially the Afuera type—cracks much in hot weather. "La Bina da Vino" (Bina gives wine), says an old Spanish proverb, and upon the proper carrying out of this shallow culture and especially the careful tapping and filling of cracks, the yield of grapes is considered to depend in no small measure. The number of times Bina is performed depends on the growth of the weeds and the extent to which the soil cracks—as a rule it is done twice during the summer.

GENERAL FEATURES OF THE DISTRICT.

Wine-making methods and the very special treatment by which high-class Sherries are reared will be dealt with in a separate report, as well as the distillation of Spanish brandy which is an important industry in Jerez, but the present one would not be complete without a few general remarks concerning this most interesting district.

In its present state it is a very different place to what it was thirty-five years ago, for the year 1874 saw the height of its prosperity. Vineyards were then selling for up to £400 an acre and *Mostos* (fresh grape juice)

sold freely at 400 pesetas a butt, or about 3s. a gallon. The town of Jerez was one of the richest in Spain—certainly the richest for its size—this great prosperty being entirely due to the shipment of Sherry. Even now it is a prosperous place; its population is about 60,000 and it is one of the cleanest and best built towns in Spain. It is a town which has a special character of its own, with its whitewashed walls and light blue window-gratings—every house is whitewashed on the 24th June of each year. The almost complete absence of signboards, on which there is a tax, and the tree-planted streets give a very agreeable appearance to the town. The older streets are chiefly planted with orange trees trained with very high trunks. At the time of my visit they were laden with fruit which brings in a small revenue to the city council. In some of the newer streets sheoaks have been planted. They appear very curious to an Australian amid such unfamiliar surroundings.



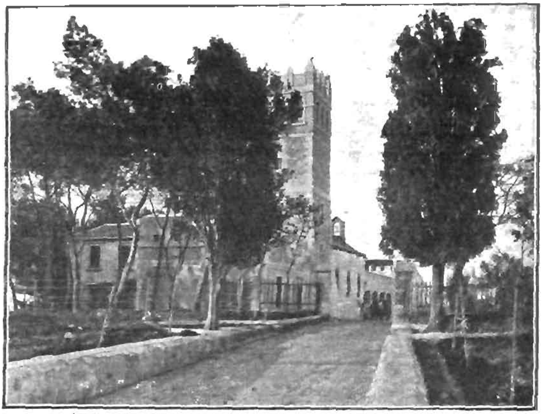
CASA DE LAGARES (CRUSHING HOUSE) AT "EL CARIBE."

The decline of the Sherry trade is a curious fact and one which is hard to explain. Though a very large business is still done in Sherries, it is nothing compared to what it used to be. The type of wine now in demand is of a lighter type known as *Fino* in Spain. The fuller wines of the *Oleroso* class which were the chief glory of 30 to 40 years ago are now quite neglected. Jerez people complain that now-a-days business is only done in cheap wines; many of those who have accumulated large stocks of high grade wines are practically ruined owing to the present difficulty of selling these very expensive wines at anything like a payable price.

Many reasons are given for this depressed state of the Sherry trade. Merchants are blamed for blending in wines from other districts in order to meet the demand for a cheap article. Dr. Thudicum's adverse criticism of Sherry from a "health" stand-point is also blamed. His condemnation appears to have been due to personal reasons rather than to the

merits of the case. The story is, however, too long a one to be gone into here.

The declining popularity of Sherry is probably due to a change in fashion more than to anything else—a change which is difficult to understand for no wine is cleaner, more delicate, or possessed of greater distinction than a really high-class Sherry. This change of fashion took place prior to the outbreak of phylloxera. It is, together with affinity difficulties in Afuera soils, responsible for the small area as yet reconstituted.

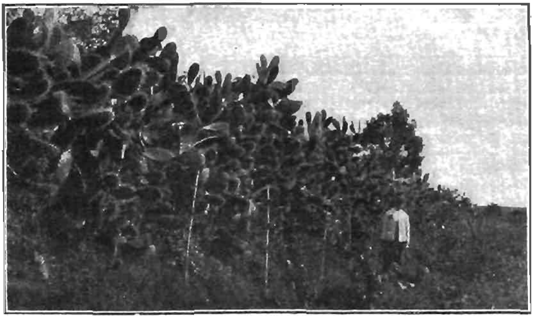


"CASA DE MACHARNUDO," A VINEYARD HOMESTEAD.

The country around Jerez consists mainly of slightly undulating land and, though some olive groves and also pine plantations are to be met with here and there, the whole country strikes one by its bare, bleak, low hills and the general absence of timber. The slopes of these hills were formerly covered with prosperous vineyards, but now are largely devoted to wheat-growing if the soil is sufficiently rich, and to grazing. They are still dotted with the *Casas de Lagares*, or crushing houses, where the wine was made in former days. The accompanying photograph of "El Caribe," one of the properties of Don Pedro Gonzalez y Soto, may be taken as typical of most of them. The fine Casa belonging to the firm of Pedro Domecq—Casa de Macharnudo—is also illustrated. This photograph shows the homestead at one of the finest reconstituted vineyards in the district. Another striking feature of the country is the high prickly pear hedges to be met with every here and there which give a picturesque appearance to much of the landscape. They make a quite impenetrable fence and one which produces a large quantity of edible fruit. The prickly pear or Chombo plays quite an important part in the food supply of the poorer classes. One of our illustrations shows a vineyard fence of this plant. These are now in many cases being cut down

as the prickly pear is looked upon as a great soil robber. These hedges are also becoming unpopular as they afford protection for vermin.

My grateful thanks are due to all those who assisted me in the work of my mission. Though I received valuable information from growers and merchants, too numerous to mention individually, I cannot refrain from more particularly thanking those whom I had the good fortune to meet frequently. To Don Pedro Gonzalez y Soto, managing partner in the well known firm of Gonzalez, Byass, and Co., I am most particularly indebted. Most of the information I have collected concerning the making and rearing of Sherry was imparted to me in the most generous spirit by Don Pedro in the magnificent Bodegas (wine stores) of his firm to which I paid repeated visits. He also placed his numerous fine vineyards at



A VINEYARD FENCE NEAR JEREZ.

my disposal for the study of problems connected with reconstitution. Mr. Walter Buck, British Vice-Consul at Jerez, and partner in the firm of Sandeman, Buck, and Coy., gave me similar generous aid, as also did Don Francisco Ivison y O'Neale, Don Manoel Domecq, Don José de Soto, and Messrs. Diez Hermanos. To Don Fernando Garcia Riquelme I am indebted for much valuable information, more especially in connexion with soil analyses and the chemistry of the wines of Jerez. From Don E. Noriega, Director of the Granja or Government Experimental Station, I also received valued assistance. To these gentlemen and to those others whose names want of space has prevented my mentioning here, I take this opportunity of tendering my sincere thanks.

HINTS ON PLANTING FRUIT TREES.

C. T. Cole, Inspector, Vegetation Diseases Act.

There are four things essential to the welfare of newly planted trees, viz., Trenching, Draining, Planting, and Mulching. Most people think if they procure a young fruit tree or vine from a nursery, dig a hole in their garden and put it in, that it will be sure to grow and bear fruit. They are, however, often disappointed and nurserymen get the blame for selling them inferior trees or plants. If a little thought were exercised in the preparation of the ground and other matters, the results would be more satisfactory to all concerned. Beginners and others will find the following short instructions helpful.

TRENCHING.—Trench the ground from 15 to 20 inches deep if the soil be rich, such as is found on the banks of rivers and creeks. Should it be poor and sandy, 2 feet will not be too much; but if the soil be good, although not so rich as that found by the sides of rivers and creeks, 20 inches will be found quite deep enough. Many think it necessary to turn the subsoil on the surface; but my experience in many places makes me favor retaining the surface soil in its natural place. When good drainage is provided, 6 inches may be added to the depths mentioned, but in no case trench deep where the water cannot readily be got away. I have seen a piece of ground trenched where a clayey subsoil was thrown on the surface; the trees were duly planted, but the first few heavy rains ran the surface together like cement, and it took years of working and manuring to bring it into a nice open soil again. During this time the original surface soil was below, entirely out of the influence of the atmosphere, and when turned up for a new plantation was quite sodden, and sour; the roots had not penetrated it, nor never would, although it was by far the better soil. The ground had not been drained by either of the methods mentioned further on; otherwise the result would have been much more satisfactory. Even then it was doubtful whether it would not have been better if the subsoil had been left where nature had placed it.

In performing the work, supposing the depth of the trenching to be 15 inches, the soil should be removed from the first trench to the depth of 10 inches, and the remaining 5 inches of subsoil turned up in the bottom of the trench, and there allowed to remain as turned up, without being finely broken. The next trench should be opened, filling up the one previously made; dig up the subsoil as before, and so on, every successive trench. If 20 inches is the desired depth, dig the first trench out 12 inches deep, and break up the remaining 8 inches of subsoil as mentioned for the 15 inches. When 24 inches is the depth desired, the first trench should be dug out 14 inches deep, breaking up the remaining 10 inches as before.

If this mode of preparing the soil is adopted, the trees or vines cannot fail to make good headway. It will be seen from the foregoing that, though the surface soil has been moved to a considerable depth, it is still retained near the surface where the trees can get the benefit of it, whilst the lowest subsoil moved is allowed to remain below.

When the soil is not very good, or an old plantation is being dug up for a second planting, a moderate application of manure dug into the bottom of the trench will prove of great advantage. The surface can be manured at convenience, after the trees are planted; this is necessary when the soil is naturally poor.

The foregoing remarks, of course, do not apply in all cases. There are districts where a layer of gravel is found under the surface, cemented together like stone. Where such is the case, it becomes necessary to bring it to the surface where it can be managed or removed away altogether. Again, some of the mellow chocolate soils are naturally well drained, and almost as loose two feet below as on the surface. Where these exist, the soil may be turned about anyhow; but, generally speaking, and under most circumstances, I believe the above system, or something approaching it, will be found satisfactory.

DRAINING.—Draining is of the utmost importance to insure success in plantations of fruit trees and vines, especially those of fruit trees. It can be done by laying drain pipes at equal distances through the soil. This is the most approved method, and where practicable and well performed, is productive of great results. Surface draining can also be carried out. The latter is done by throwing the ground up into beds from 10 to 15 feet wide for one row of trees, and forming narrow deep walks or drains between every bed, to carry off the surface water and to drain the beds. If possible, the bottom of these drains or walks should be as deep as the trenching of the beds, in order to carry off the whole of the surplus water out of the trenched ground.

In moderately dry soils, beds may be formed wide enough to hold a double row of trees. This mode of draining can be carried out with very satisfactory results; a greater surface is thus exposed to the beneficial influences of the atmosphere. Under this mode, surface draining is especially adapted for ground where there would be no outlet for the water from underground drains. Trenching in such ground should not be deep; the soil from the walks or drains would materially increase the depth of soil on the beds. There is, perhaps, a little more difficulty in keeping the ground as neat as when it is formed in larger squares, with underground drains and ordinary garden walks, owing to the deep sides to the beds.

PLANTING.—When selecting fruit trees, be sure and procure them with short stems, as long stemmed trees are greatly subjected to heavy winds which injure the roots; the sun is also apt to burn the stems. Tall stemmed trees are a mistake as their crops are difficult to gather and their management in general is troublesome. In preparing the trees for planting, cut off all roots to an equal distance from the stem, making the cut under, from the centre to the outside. I would advise early planting of fruit trees, provided the soil is in a mellow condition. In the case of stubborn clayey soils where it is cloggy, it would be best to leave planting until early spring. In the meantime the holes could be dug and exposed to the atmosphere, which would greatly improve the soil. When the ground is in a fit condition for planting, and the places for the trees are marked out, make holes about 2 feet square; then dig up the bottom and fill the holes up to the required depth the trees need, with soil from off the surface only. Never plant a tree deeper in the ground than what it has been in the nursery beds. Much harm has been done through too deep planting. Nothing can be more injurious, either in the present or future success of an orchard, than to bury the roots away from the influence of the atmosphere. When the tree is placed in the hole prepared, be careful to spread out all its roots as equally around the hole as possible, so that the tree when growing can derive the benefit of the soil all around it. Then fill in the hole to near the top with nice mellow soil taken from the surface and shake the tree gently so that the soil can get well amongst

the roots. Tread lightly around the bole; be very careful to tread each corner well so that when the rain comes the ground will not sink and form a basin for the water to lodge in and injure the tree.

The pruning of young trees should not be done when first planted, because we often get a spell of warm weather which forces the first buds to sprout if pruned when first planted. The heavy frosts which are usual at that season of the year would cut them back, often destroying the leading buds. Pruning is best left till early spring.

MULCHING.—It often happens, especially in these States, that an early dry spring comes and proves very injurious to newly planted trees. I would therefore recommend a light mulching of horse manure or grass, which would be of great benefit to the young trees, keeping the ground moist and cool during the summer; afterwards, it can be forked in around the trees, and become a further benefit to them.

GROWING FODDER AT LONGERENONG AGRICULTURAL COLLEGE.

The accompanying illustrations have been supplied by the Principal, Mr. G. A. Sinclair, who has also furnished the following particulars relative to the results obtained at Longerenong from the varieties of maize imported last year by the Department of Agriculture, and distributed throughout the State.

SOME OF THE IMPORTED MAIZE VARIETIES.

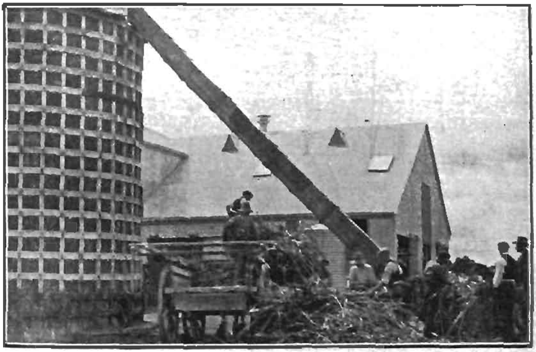
Left to right—Hickory King, Hildreth's Yellow Dent, Boone County Special—three rows of each.

"The seed was put in on 16th October in the same paddock with about 1 acre of Ninety Day maize, and $1\frac{1}{2}$ acres of sorghum. The imported varieties of maize were drilled in rows three feet apart with a view to after-cultivation by the horse and Planet Jun. cultivator. This was not carried out, as the soil kept loose and friable. The sorghum and Ninety Day maize were sown with the drill in rows seven inches apart. We grew these crops for summer fodder, to be converted into silage, but also with the intention of keeping for seed any of the new varieties which proved suitable. Owing to delay in the alteration of machinery, the maize was well advanced when cut, and admitted of notes being made regarding the cobs.

The land is a small paddock which we intend to lay down in lucerne for cutting with the mower, instead of grazing off, which has been the

A FINE CROP OF SORGHUM—AVERAGE HEIGHT, 11 FEET.

practice here. It was a very rough piece of ground originally, and full of crab-holes. It was ploughed up and graded the winter before last, and



FILLING THE COLLEGE SILO.

then sown with Ninety Day maize. The ground was graded again last year, and will be graded once more before sowing down with lucerne.

Forty pounds of superphosphate per acre were sown with the seed. Only two waterings were actually given, one at the beginning of November, the other in the middle of January. The water was put on a third time to reach some corners which had been missed at the second watering.

The maize gave about seven tons of silage to the acre. The silage was made in one of the Departmental overhead silos, and was a splendid sample.

The following are the notes made of the imported varieties:—

1. *North-Western Dent.*—Short growth, average height about 3 feet 6 inches, cobs well filled, ripened early.

2. *Triumph Flint.*—Short growth, average height about 3 feet 6 inches, cobs not so well filled, ripened early.

3. *Mexican.*—Short growth, average height about 3 feet, cobs small and badly filled, ripened early.

4. *Minnesota King.*—Short growth, average height 4 feet, big seeds, cobs small and badly filled, ripened later than previous varieties.

5. *Hickory King.*—Well grown, average height about 9 feet, large cobs, well filled, late ripening.

6. *Hildreth's Yellow Dent.*—Well grown, average height about 8 feet 6 inches, large cobs, well filled, late ripening.

7. *Boone County Special.*—Well grown, average height about 7 feet 6 inches, late ripening, cobs large and fairly well filled.

The photograph shows varieties 5, 6, and 7. The row where the student is standing is Hickory King. The Ninety Day maize grew irregularly; its average height was about 6 feet. The cobs were fairly large, and ripened late.

The sorghum (*S. saccharatum*) was a splendid crop, with an average height of about 11 feet.

PRICE AND PROFIT IN COWS.

J. S. McFadzean, Dairy Supervisor.

The want of rain in the several districts from which the metropolitan milk supply is drawn has resulted in a very serious reduction in the quantity available for daily consumption, with the consequence that exceptionally high prices are at present obtainable in the Melbourne market for first class dairy cows in full profit.

To a dairyman always, and especially now that feed-stuffs are so high in price, the cow that can give an extra large return in milk is an object of much interest; and if she is for sale it naturally follows that her price is principally governed by her apparent capabilities as a milk producer. If, therefore, a cow can be bred that will give as much milk in 24 hours as would be given by two fairly good cows in the same time, her value to a dairyman should be more than that of the other two combined, as she will cost less to feed than they. At any time this question of quality in his cows is an all-important matter to every dairy-farmer, but with many it has required the present exceptionally bad

season to make them thoroughly realize its significance. Right through this State there are hundreds of cows being fed at a loss year after year, and if this present scarcity of fodder has the result of bringing their owners to the point of culling these out, keeping only the best, and thus permanently raising the grade of their herds, it will eventually prove the most profitable year they ever knew. There are many small dairymen in the suburbs of Melbourne who keep from four to six cows the year through, principally by hand feeding, making a living solely from the sale of their milk, and the total daily yield from their cows throughout the greater part of the year will not equal that obtained from the one whose photograph is shown on the front cover of this month's *Journal*.

This cow was sold by Mr. C. F. Hegarty, of Bacchus Marsh, at the Dairy Cattle Market, Elizabeth-street, Melbourne, on 15th May, for £20 10s.; and the purchaser was Mr. Curley, dairyman, Callantina-road, Hawthorn. She was sold as a Shorthorn—Ayrshire cross, on her third calf, and solely on her milking qualities—which were represented by her having given 26 quarts per day in the flush of her last milking period, and being equal to not less than 16 quarts daily, even with the present scarcity of green fodder. This latter she has already shown herself to be quite above; for the day after she was purchased she gave 18 quarts, and four days later she had reached 21 quarts; and, being then only 11 days calved, she might reasonably be expected to improve considerably on this. On appearance her breeding would be more aptly described as "grade shorthorn"; and she is said to have been bred by Mr. R. Lidgett, of Myrniong, who makes the milking shorthorn his speciality.

She is a big framed cow, showing none of the Ayrshire characteristics; and her color is almost the dark red of the Hereford with white underneath the body. She is very evenly proportioned, so that standing alone she does not appear as large as she is; and it is not till another cow is seen beside her that her size is noted. From a dairy stand-point she handles well, with nice soft skin and a free well balanced udder. She shows well developed milk veins and good escutcheon; is fairly well ribbed and broad over hips; fair on shoulder; rather full in brisket; clean looking head and neck, but both eye and nostril rather small; has kind temper; is apparently a good doer; and altogether has the general appearance of being a good all round dairy cow. She has, moreover, proved herself superior even to her looks: for on her yield of 52 lbs. of milk in 24 hours, as weighed on the 20th May, she tested out 4 per cent. of butter fat; which would make her cash return equal to 19s. 4d. per week if her cream was sold at the present factory price, £2 2s. 5d. per week if the milk is sold at present wholesale price of 14d. per gallon; or £3 per week if the milk is sold retail at the 5d. per quart at present obtaining in Melbourne. According to this she must be a cheap cow, even at the price paid, £20 10s.

Mr. Curley has also several other very well bred and highly profitable stock in his herd, but they are mostly of Jersey blood. His bull, too, is of this breed, and a bit above the average quality in breeding; being a purchase from Mr. Chirnside's Werribee Park herd at a price rather higher than that of the big cow. On every well-managed farm the paying of a good price for a correspondingly good animal means so much working capital re-invested where it stands every chance of returning an increased dividend to the owner.

GARDEN NOTES.

J. Cronin, Principal, School of Horticulture, Burnley.

The Abutilon.

The species and varieties of Abutilon cultivated in gardens are evergreen shrubs; the genus also includes herbs or annuals that are of botanical interest. The habitat of the majority of abutilons is Brazil and adjacent parts of South America, a few species being found native in Central and North America, and Australia. The name that the abutilon is commonly known by—the Chinese lantern flower—would suggest the occurrence of the genus in China or other Asiatic countries, but it is on account of the resemblance of the flowers of some of the species to the well-known Chinese lanterns that the popular name is due.

ABUTILON BLOOMS.

Many of the abutilons are highly ornamental shrubs, varying from four to eight or ten feet in height; the foliage in some of the species and garden raised varieties is distinctly palmate in character, the flowers, borne on long slender stalks, being bell-shaped and pendulous or drooping. In many instances the hybrid varieties are a distinct improvement on the original species in habit of growth, size and substance of blooms; the coloring of the blooms is also more varied and beautiful. The genus now includes kinds and varieties that produce flowers of shades of orange, yellow, red, pink, rose, and white; many are distinctly veined or marked with other shades of color. With many kinds the foliage is their principal value in schemes of border decoration, being beautifully variegated. Abutilons are hardy in most parts of the State and being of easy culture are worthy of much more care and attention, and extensive planting. They are well suited for planting in large groups or borders as specimens or sub-shrubs, endure a deal of drought, and provide a fine effect when well established.

CULTURE.

The soil most suitable is a rather light loam, well drained, and moderately manured. Abutilons, however, will thrive fairly in most garden soils where the ordinary routine phases of cultivation that make up fair management are practised. Excessive manuring, or excessive watering when the soil is rich, will promote rank growth that will fail to bloom satisfactorily, and, in the case of the variegated forms, cause them to revert to the green. They are also accommodating in regard to position, and may be planted with a prospect of success in any aspect excepting those excessively windswept. Plants may be set out from pots at any time during the season of active growth, spring or early autumn being preferable. They will require to be watered during dry hot weather until established, and will benefit by the application of a mulch if the conditions are severe.

Pruning is necessary to insure well balanced plants. When young plants are being formed pruning consists mainly in pinching, or lightly topping, any shoots of excessive vigor. The object is to check these and permit the weaker shoots to overtake them. When the plants are formed they occasionally become crowded in the centre. A moderate amount of thinning is required so that light and air are admitted to all parts of the plants. Old plants are liable to become tall and straggling in habit and should be pruned in winter, cutting the shoots well back. The result on healthy plants is the production of vigorous growth that requires to be regulated as in the case of the young plant.

Abutilons are propagated from cuttings and seeds. Cuttings of the young shoots inserted in pots of sandy soil, and placed in a cold frame, root readily. When the cuttings are rooted they should be potted, and, when established, planted out. Such plants are not likely to receive much check by the transplanting and with a little care in pruning usually develop into nice specimens. Cuttings of the strong shoots will also root readily in the open ground if taken and inserted in sandy soil during winter. These may be allowed to grow in the nursery until autumn, and then lifted and transferred to their flowering quarters. Such plants require to be pruned hard to compensate for the loss of feeding roots destroyed in the removal. Seeds should be sown in pots or boxes of light soil in spring. The plants should be potted when about an inch in height, and grown in pots until they are about a foot in height, when they may be transplanted into the beds or borders. If a good strain of seed is sown improved varieties may result.

DESIRABLE VARIETIES.

A number of fine varieties are procurable in Melbourne. A few of the best are :—Boule de Neige, Driven Snow, Fleur de Neige, Golden Fleece, Aurelia, Sydney Belle, Brilliant, Emperor, Scarlet Gem, Cerise unique, Violet Queen, Roseœflorum, and *vexillarium*, the foliage of each being green. Varieties in which the leaves are variegated are :—Sawitzii (rather delicate), Souvenir de Bon, Aureum variegatum, Darwinii tessalatum and *vexillarium variegatum*.

Flower Garden.

Planting deciduous trees or shrubs, which may be taken to include such subjects as roses that are practically in a state of rest ; and digging and manuring as advised last month are seasonable features of gardening at present. Propagation of hardy deciduous plants by the insertion of cuttings

in the open ground should also be done at this season. A sufficiently explicit definition of deciduous plants is, that those are included that lose the whole of their leaves during autumn and early winter and remain leafless until spring such as the elm, pear and other trees. Those that lose the greater part of their foliage such as the rose—excepting a few forms that are practically evergreens—may be considered as semi-deciduous and in a great measure amenable to the treatment recommended for the deciduous. A sandy and unmanured soil is most suitable for striking cuttings of either hardy or tender plants. As usual local nurserymen have imported a number of new roses, several of which promise to be valuable additions to the already long list. From an exhibitor's stand-point, a really fine everblooming red rose is badly needed. Several hybrid perpetual varieties of that color are first class, but are shy bloomers compared with the hybrid teas. A good yellow is also wanted, and in each instance it is claimed that they are included in the batch of "Novelties" of the present season. "Avoca" is described as a hybrid tea, crimson scarlet in color, of fine size and form, and has been awarded the Gold Medal of the National Rose Society of England. "Harry Kirk" is said to be the finest yellow rose yet raised, and each of the above-mentioned varieties is very promising. Other varieties noted as being worthy of trial are :—"Lyon Rose," "W. E. Lippiat," "Mrs. Isabelle Milner," "Queen of Spain," and "Dorothy Page Roberts."

As the plants die down to the ground dahlia tubers should be lifted, cleaned, and stored in a cool dry place until spring. Stools of chrysanthemums should be removed from the beds where they were grown for the production of large flowers, and replanted in rather poor soil in an open sunny position to insure the sucker growths being sturdy and hardy when needed for propagation in September.

A batch of gladiolus corms may be planted to produce their flowers early in spring. A deeply worked and rich soil is necessary for the production of very fine flowers.

Kitchen Garden.

Asparagus beds should be cleaned as soon as the tops are dead, and a dressing of manure worked into the soil. A crop of some quickly maturing vegetables, such as lettuce, may be planted between the rows of asparagus, and will be matured and used before the beds again need attention. Ground should be prepared at once if the planting of asparagus is contemplated this season. A deep rich moist soil in a fairly open position is required for its successful cultivation. Plants may be set out during June, July, and August, young plants one or two years old being better than divisions of the old crowns. The plants should be set out in rows three feet apart, allowing two feet between each plant in the rows. Asparagus plants should be set deep, six inches below the surface in the case of heavy soils, eight to ten inches in light sandy soils.

Onions raised from seeds sown in April may be transplanted. The roots may be cut to about half their length, and the plants set out about three or four inches apart in rows sufficiently distant from each other to admit of cultivation. Onions require shallow planting, the same depth that the young plants occupied in the seed bed being suitable.

Seeds of peas, beans, onions, and saladings may be sown for succession.

EXPORT OF HONEY.

Writing from London on 27th March, the Agent-General for Victoria (Hon. J. W. Taverner) has furnished the Minister of Agriculture (Hon. Geo. Swinburne, M.L.A.) with the following report relative to the export of Victorian honey to the United Kingdom :—

"On Tuesday last I saw Messrs. Cosmelli, Meyer and Company, leading honey brokers of this city, whom I have consulted on previous occasions. They are very anxious to do what they can to increase the honey trade, and as you will see by the copy of a fully detailed letter enclosed they are even prepared to join with the producer if necessary. The honey they refer to, being the only samples I have here, they were very satisfied with, and they think there should be no difficulty in netting 2½d. per lb. So far as Victorian honey is concerned it must not be forgotten that some honey sent over has the flavor of eucalyptus, and other honeys have had the flavor of tallow. The three honeys I submitted to Messrs. Cosmelli, Meyer and Company were :—

JB Honey (Messrs. W. J. and F. Barnes, East Melbourne), Ben Nevis (extracted and bottled by Mr. C. B. Sumsion, Oakleigh), and Swallow and Ariell's Pure Garden Honey.

Mr. Meyer informed me after tasting them that, if our producers continue to deliver similar honey, they (Messrs. Cosmelli, Meyer and Company) could sell 50 to 60 tons per year. Messrs. Cosmelli, Meyer and Company is one of the leading firms here and if you could induce others engaged in the industry to send consignments to them or co-operate with them you may depend upon getting the best results. Our exports to various places come to only 8 tons yearly so there is room for expansion if our people will only send across honey of a uniform and good quality.

Messrs. Lyons and Company receive an annual vote from the South Australian Government for placing their wines on all their menus, and they undertook to take a certain quantity of South Australian honey. I am informed that the honey is put in lb. bottles. The retail trade people prefer to buy it in bulk and to put up the article in their own jars and bottles. As you know, my advice has always been to be extremely careful not to interfere with the system of distribution of produce in this country, as in the long run it would recoil on the producers. I venture to say that our produce will derive larger returns from the cask trade. Compared with South Australia the Victorian honey trade with the United Kingdom is more than double, and capable of large expansion if our people will send over regular supplies of good honey. Your proposal to make advances upon properly graded honey should result in increasing our trade. I am not afraid of the prices, provided the product is right and suitable for this market."

Copy of Letter from Messrs. Cosmelli, Meyer & Co.

24 Eastcheap, London, E.C.,
24th March, 1908.

The Hon. J. W. Taverner,
Agent-General for Victoria,
142 Queen Victoria-street.

Dear Sir,

Referring to the visit this morning of our Mr. Meyer as regards the importation of Victorian honey, we should like to give you a little essay on this article in order to facilitate any future business which may come along. The honey might be used for several purposes, chiefly for manufacturing as a substitute for high class

sugars, and for shops to sell in 1 and 2 lb. jars for house consumption. There are also a few other outlets such as for medicine. In order to cater for all requirements it will be wise to have the honey sorted on the other side, so that we can right away offer into correct channels without having to get the goods graded at this end

For eating, that is to say shop purposes, we only can recommend you to bring along white and water white honey. We have before us your samples J.B., and the honey packed by C. B. Sumsion, both of which qualities are very nice in color and would do excellently for putting up in jars. Anything as good in color as the J.B. can be classified as water white and anything about equal to C.B.S. could be classified as white honey, and we certainly think they would pass the standard. Darker honey would not do for shops but would come in for manufacturing purposes. These very high grade honeys we suggest you put up in standard oil tins which have been thoroughly well cleansed, packed two tins in a case, which would then represent about $1\frac{1}{4}$ cwt. of honey, and we should say we would find a ready market at this end where it will come mainly into competition with Californian honey. It is preferable that this honey should arrive in London in a liquid state because it is then easier to handle, but should it arrive in a set state it will not materially interfere with the sale, because all importers are aware that honey will set at one time or another.

The idea of bringing the honey over packed in glass jars will be found impracticable for the following reasons :—

Firstly, we presume the glass jars and the labor of putting honey into them will be fairly expensive over there.

Secondly, the honey would have to be packed in cases containing 24 or 28 jars which would make a pretty heavy package and increase the freight.

Thirdly, whilst we can insure barrels against leakage and rough use during the journey, it would be impossible for us to insure glass bottles against breakage as no insurance company would accept such a risk. Should any bottles get broken, a thing which seems quite feasible to us, the honey would run all over the other bottles and for all intents and purposes that case would be lost because with one bottle missing the others would soon shake about and smash each other. The outside and inside of the case would show stains and the case would have to be made merchantable at the wharf before we could do anything with it.

Fourthly, the large shops and stores here are in the habit of purchasing their white and water white honey in barrels or tins and they fill their own bottles, which method shows them an advantage which they would not be willing to sacrifice on any account, the more so as they stick on their own labels and would not care to sell brands which are no advertisement to them at the same time.

Finally, the introduction of such honey in bottles would be terrible work for anybody who wished to push the line and as far as we are concerned we would not undertake such a job, as we know we should not be able to sell any quantities and the results would not be satisfactory either to ourselves or the shipper on the other side.

Honey for manufacturing purposes would have to come along in barrels containing 2 cwt. or more but it will not be wise to make the barrels too heavy because they become unmanageable, and good strong barrels must be used. It does not matter if the barrels are second hand as long as there is no trace of the previous liquid to affect either the color or flavor of the honey. This honey also ought to be well graded and if there are deviations of color in a parcel it will be well for the shippers to mark different numbers on the end of the barrels, so that when the goods arrive they can be piled according to the numbers at the wharf. This will also save expense because it would save us having each cask sampled at the wharf if we could draw a representative sample from three or four barrels.

As regards quantity we should say we would be able to place all you can offer us, both of the fancy and manufacturing honey, provided naturally that prices are right to compete with honey which comes into this market from all parts of the globe. Your two sample bottles show really high class honey, and we should say this fancy article will find a ready sale in the shops.

The strongest competition with which you will have to contend is from California and Jamaica, and in order to introduce your honey it will be necessary to quote a bit below Californian prices. This, however, should be comparatively easy because California has a large outlet for honey in the United States and they practically get the same prices for their surplus as they do in the home country. They have also high freights to reckon with, because they must either ship the goods overland from California to New York and thence by steamer to London or by steamer all the way, so we think you almost could save something on this item. Prices naturally fluctuate according to supply and demand. We have known Californian

water white honey as cheap as 23s. to 24s. and as dear as 35s. per cwt. of 112 English lbs. c. and f. London. At times you will have a struggle to compete and at other times you will be able to compete and make a handsome profit. This will vary from season to season and we shall be able to advise you in this matter because we are in direct touch with California and purchase honey year by year.

There now remains to find out if you will be able to deliver fine honey of good color, equal to samples submitted, regularly. It will also be necessary that the honey is of the same flavor as the sample and quite free from eucalyptus and tallowy flavors, because these are very much objected to at this end. As regards the darker honey these also should come in casks and should on no account be put into tins. Here, also, the prices vary according to supply and demand and we cannot to-day give you a quotation because the market might have changed very considerably by the time your information reaches the other side. Your honey will find its level and you can rely on its fetching market value by the time it arrives. We are doing a fairly heavy business in honey and we will gladly take up your qualities as well and will go out of our way to initiate the business, as mentioned to you this morning.

If necessary we would be prepared to do the business for the first year or so on joint account with your friends, until we have found the proper basis on which we can work. If this is not approved of, may be your friends will send us a few consignment parcels in order to enable us to introduce the goods, or failing this we would even be prepared to place an order with them if absolutely necessary; in case of consignments we would pay 75 per cent. of the value against documents on arrival of goods, or your friends could draw on us for the amount.

We are anxious to do the business if at all possible and you can rely on our utmost support in this matter.

Trusting that some good business will result in this direction,

We remain,
Yours truly,
COSMELLI, MEYER & CO.

FARM REPORTS.

QUARTER ENDED 31ST MARCH, 1908.

Whitfield Farm

Temple A. J. Smith, Manager.

During the quarter this district has experienced the worst drought in the past forty years. Added to this locusts in great numbers destroyed the grass and many of the crops. Notwithstanding these drawbacks good progress has been made with the farm crops and stock.

CROPS.—The hay crop of eighteen acres gave a yield of nearly 30 cwt. of clean good hay per acre, and was harvested in good condition. This has all been chaffed, a portion being sold, and the balance kept for consumption on the farm.

The millet crop was completely destroyed by locusts. The paddock was at once re-ploughed, and maize sown as late as 5th January, with excellent results. The maize was planted three feet apart each way, and the hoe was kept going during the dry weather. The growth, considering the dry weather, was good, the stalks being from 8 to 12 feet high, and of thick sappy condition. Seven and one-half acres were sold green for starving stock, and sent by rail to Springhurst. This is the first time in the history of the district that green maize has been so treated. Though it was more than 24 hours on the trucks, excellent silage was made. The varieties grown were Ninety Day, White Horse, and Sydney Flat Red, the last-named making far the best growth, with the White Horse next. The balance of the maize crop was kept for the use of the stock on the farm.

The tobacco crop (3 acres) made little headway for a good while, and misses had to be filled in four times in some cases. The ground sweetened, however, with scarifying, and in March the crop made satisfactory growth, and a fair yield of approximately 25 cwt. was safely harvested, and is curing well in the sheds. A large quantity of seed of the better varieties was saved for distribution. The plot of tobacco grown on the high land caused favorable comment by visitors, the plants making excellent growth and maturing well.

STOCK.—The cattle, consisting of fifteen head sent from the Rutherglen Viticultural College, are in good condition. The horses, also, are in first-rate order.

GENERAL WORK.—The whole of the paddock has now been cleared of scrub and the fallen timber picked up. Much of the latter has been stacked for use as firewood, and the balance burnt. Further paddocks aggregating 23 acres have been cleared ready for the plough, making a total of 63 acres now available for cultivation.

Rabbits have been carboned and poisoned and the burrows destroyed. All stinkwort plants have been pulled by hand.

The drain along the railway has been completed for 12 chains, and some of the older drains have been cleaned.

Wyuna Irrigation Farm.

G. H. Tolley, Manager.

RAINFALL.—The amount registered was, January .33; February .12; March 1.51; total 1.96 inches. The fall for the corresponding period of 1907 was 1.75 inches.

IRRIGATION.—Full use was made of the supply available, but, contrary to expectations, it is both irregular and deficient and cannot be satisfactory until the main Eastern channel is in complete working order.

STOCK.—Two cows were sold for slaughter and one died, thus reducing the herd to 39. The average number milked and the yields will be seen in the following table. The natural increase has been 4 bulls (killed) and 6 heifers:—

Week ending—	Cows milked.	Milk.	Cream.
		lbs.	lbs.
14th Dec., 1907 ...	24	2,701	182
21st " " ...	26	2,940	198
28th " " ...	27	2,862	188
4th Jan., 1908 ...	28	3,036	209
11th " " ...	28	3,574	217*
18th " " ...	28	3,686	222*
25th " " ...	28	3,644	250*
1st Feb., 1908 ...	28	3,618	258*
8th " " ...	28	3,276	258*
15th " " ...	29	3,310	268*
22nd " " ...	32	3,708	312*
29th " " ...	32	3,603	234*
7th March, 1908 ...	29	3,515	229*
14th " " ...	29	3,480	302*
21st " " ...	31	4,050	279*
28th " " ...	32	3,870	239*

* Fed during this period with lucerne hay, and silage, chiefly the former.
Average yield per cow per day, 17½ lbs.

SUMMER CROPS.—The silage previously saved lasted until the 24th March. Silage making was started on the 27th, and so far the yields have been:—1 acre of amber cane, 16 tons, and 1 acre brown Kaffir corn 6 tons; the remaining 9 acres of similar crops are expected to yield about 3 tons per acre. The result is not satisfactory and was due largely

LUCERNE CROP READY TO CUT.

to the lateness of the sowing; mangolds suffered from the same cause but will yet yield a fair return. Lucerne has been the mainstay of the farm; three cuttings have been made, and yields have ranged up to a ton of hay per acre per cutting, some of the plants making a growth of

CUTTING LUCERNE FOR HAY.

4 feet. A glance at the returns from the dairy herd will show the results achieved from feeding lucerne hay. Horses, cows, and pigs have all been mainly fed with it and are in first rate condition. The fourth cutting will be made shortly but will be much reduced owing to water not being available for some weeks after the previous cutting was made.

The anticipated yield from the 48 acres will be reduced some 60 or 70 per cent. and will seriously affect the winter food supplies.

BUILDINGS, ETC.—The new milking shed is now in use and the advantage of yards well paved and drained is much commented on by visitors. The new dairy and boiler house are approaching completion, and the boiler and a complete milking machine outfit have been ordered. The framework and part of the walls of the new pigsties are erected, all fittings are made, and the balance of the material is on the ground. Some of the water pipes for reticulating the various buildings are also on hand. A large brick manure pit has been built and a point is to be made of saving all available manure, both liquid and solid.

The eastern boundary of the farm has been fenced with a substantial wire netting fence, and material for fencing and netting the remainder of the farm is arriving. Other fences and gates have been erected and old ones removed, the process of remodelling being well advanced.

A new elevator with a tilting chute to fill either of the two silos was built and was worked from the bottom by means of chain and sprocket geared to the chaffcutter and carrying the ensilage up the reverse way. It worked well and no difficulty was experienced. A number of culverts, regulators, and outlet boxes have been made and fitted to the irrigated areas. Brickmaking was finished on 31st January, 5 kilns in all having been burnt.

CULTIVATION.—84 acres of the timber paddock have been steam ploughed, harrowed, and rolled, and are in course of being graded for irrigation; 74 acres will be sown to lucerne and the methods of irrigation by contour checks, borders, and furrows will be followed in some part on similar lines to those laid down by Mr. Elwood Mead, Chairman of the State Rivers and Water Commission, for the Lucerne Competitions initiated by him. Ten acres of the area have been set aside for an experiment in growing various kinds of wheat under the direction of Mr. F. E. Lee, Agricultural Superintendent, twenty acres of the "Oat" paddock have been irrigated and cultivated and sown with a mixture of barley, peas, and beans for grazing and silage purposes. The "Plain" Paddock (44 acres) has been disced and cross disced and will be sown with Federation wheat as soon as rain falls. Other smaller paddocks are in process of preparation for various crops.

MISCELLANEOUS.—Levels have been taken for a number of settlers and designs made for irrigating their blocks. Many landholders have expressed a strong desire that an officer for this purpose should be detailed, as required, to do similar work throughout the irrigation areas, and there is no doubt that many of the early trials and disappointments of irrigators would be much mitigated if such a course were followed.

The Lands Purchase Board met at the farm on 21st February to deal with settlers' difficulties when there was a very large attendance with mutual satisfaction following. The Advisory Board met on 27th February and determined the general plan of operations for the ensuing season.

On 19th March, Mr. Elwood Mead, C.E., addressed one of the largest audiences yet seen on the farm on the subject of Lucerne Growing. The lecture, which was illustrated with limelight views, was much appreciated.

Heytesbury Experimental Farm.

O. H. Call, Manager.

CROPS.—The standing crops referred to in the last report have been harvested, and, as anticipated, have turned out well. The oats, although sown altogether too late, gave a return of 30 cwt. of hay to the acre. Peas were a patchy crop, and returned 20 bushels to the acre.

The potato crop has been the most successful yet grown, and will yield over seven tons to the acre. Digging will commence some time in April.

Three-quarters of an acre of Japanese millet has given a very good crop of green feed; it has been cut and eaten three times, and will stand being eaten down again. The first cutting averaged about 3 feet in height. The amount of fodder will be gathered from the fact that one cutting would have fed one cow for 117 days.

PLOUGHING THE RECLAIMED LAND.

The maize crop was a great success where sown in drills, growing to an average height of 6 feet, and exceptional stalks as high as 10 feet. Where sown broadcast, only about half the amount of fodder was taken off. The Flat Red variety and White Horse Tooth were about equal as the best, followed in order by North Western Dent, Ninety Day, and Minnesota King.

Although the cabbage plants were very poor the crop did fairly well, some of the best going over 20 lbs. weight. Swede turnips were exceptionally good where treated with stable manure, single roots weighing up to 10½ lbs., and a run of one chain averaging 6 lbs. Mangolds on the same ground have also done well. Rape and swedes were sown early in the year between the rows of trees in the orchard, and look promising. At the end of January 2 acres of rye were sown for green feed, and in the middle of March the crop was ready to turn the cows on. Early in February 2½ acres of Algerian oats were sown for winter feed, and are looking splendid.

The balance of the farm, with the exception of the timber portion, has been cleared and ploughed by the traction engine, and the work of

getting it ready to crop is being pushed on. Five acres of this ground were put in with rye at the end of March: the crop is up and looking well.

The orchard trees have made good growth and appear strong and healthy. The small fruits and vegetable and flower garden were totally destroyed by the bush fire in January, but will be replanted in the spring.

GRASSES.—These continue to do well, and go far to prove that this country will make excellent dairying land.

STOCK.—Five milch cows, ten pigs, and one horse have been bought, and are in good condition.

BUILDINGS.—A cow-shed and piggeries of bush material and iron roofing have been put up, and an addition of two rooms made to the dwelling-house.

GENERAL.—The growth of all crops has been a wonderful improvement on last year's, and it is anticipated that a further improvement will be made as the ground gets into a proper tilth, which will be hastened by the disc implements just received. The potatoes, maize, swedes and grasses are a great surprise to visitors, who are now very numerous.

NOTE.—The general aspect of the farm and the returns from the crops this season are so satisfactory that a few words as to results may be given here. The farm land has now been drained efficiently for close upon two years, and although during the first season many of the crops were disappointing, if not altogether failures, the sourness has already so far been removed as to permit of crops which would be a credit to some of our finest agricultural lands. That this sweetening process is not yet complete is obvious, so that further increase in returns may be looked for. Fertilizers have not been used in the farm to an extent greater than the ordinary practice for similar crops elsewhere, so that the general result of the work is to show successful and profitable settlement of these hitherto despised areas a certainty.

Steps are being taken to cut up, into suitable-sized blocks, the area already ploughed, combining a proportion of timber land along with the grass-tree country.

Offers have been invited for several powerful traction engines with the object of more vigorously pushing on the reclamation work. As there are at least 60,000 acres of grass tree equal to the plain at present being treated, a large field is open for future work.—EDITOR.

THE ORCHARD.

James Lang, Harcourt.

A break has taken place in the weather since last month, and the conditions are now more favorable for orchard operations. An average of about 2 inches of rain has fallen throughout the State, but much more is required to give the ground a good soaking, and moisten the subsoil.

Planting operations will be the principal work during the month, and this should be pushed on with during favorable weather. In preparing land for planting fruit trees, it should be ploughed as deep as possible—at least 8 inches. If the subsoil is inclined to be hard or stiff it should be further broken up. To do this take the mould board off an ordinary plough, and follow in the furrow already ploughed to a further depth of 6 or 7 inches; this will give a total depth of 15 inches to which the soil has been stirred. The ground should then be harrowed. Where virgin ground is being broken up for the first time, it should be done in the early spring, and allowed to lie fallow throughout the summer; this sweetens the soil and puts it in much better condition for planting.

The selection of varieties of apples for planting is a matter for grave consideration, as a good deal of the success of an orchard depends on the selection made, whether for local market or for export. In a district where there are old established orchards, the new beginner should ascertain what varieties of the different fruits succeed best in the locality. He will then be able to make his selection accordingly. In view of the rapid expansion of the trade in export apples and pears, all new orchards and extensions of existing orchards should be planted with only those varieties which command the best price in the London and Continental markets.

The distance apart at which fruit trees should be planted also requires consideration: 20 feet apart each way is the distance now generally adopted. This gives 100 trees to the acre, but in dry districts where water for irrigation is not available, they should be planted 24 feet apart each way, which works out at 75 trees per acre.

The varieties enumerated in the following lists are the best, and a selection could be made from them to suit any district in the State. It must, however, be understood that it is a great mistake to plant too many varieties; a limited number of good kinds will pay far better, either for export or local market.

VARIETIES FOR EXPORT.

Apples.—Annie Elizabeth, Cleopatra, Cox's Orange Pippin, Dumelow's Seedling, Esopus Spitzenberg, Jonathan, London Pippin, Munroe's Favorite, Newtown Pippin, Rymer, Schrœders Apfel, Sturmer Pippin.

Pears.—Beurre Clairgeau, Beurre d'Anjou, Beurre Deil, Eyewood, Glou Morceau, Josephine de Malines, Vicar of Winkfield, Winter Nelis.

VARIETIES FOR LOCAL MARKET.

Apples.—Cleopatra, Emperor Alexander, Esopus Spitzenberg, Gravenstein, Jonathan, London Pippin, Mr. Gladstone, Munroe's Favorite, Peasgood's Nonsuch, Reinette de Canada, Rokewood, Rome Beauty, Rymer, Schroeder's Apfel, Stewart's Seedling, Stone Pippin, Sturmer Pippin, Williams' Favorite, Yates.

Pears.—Beurre d'Anjou, Beurre de Capiaumont, Beurre Bosc, Beurre Diel, Broompark, Doyenne, Boussoch, Gansel's Bergamot, Josephine de Malines, Marie Louise, William's Bon Chretien, Winter Nelis.

Plums.—Angelina Burdett, Belle de Septembre, Coe's Golden Drop, Diamond, Early Orleans, Early Rivers, Grand Duke, Green Gage, Kirk's, Pond's Seedling, Prince Englebert, Reine Claude de Bavey, Washington, Yellow Magnum Bonum.

Apricots.—Alsace, Dundonald, Hemskirke, Mansfield Seedling, Moorpark, Oullin's Early Peach, Royal.

Cherries.—Bedford Prolific, Burgdoff's Seedling, Eagle's Seedling, Early Purple Guigne, Early Lyons, Florence, Napoleon Biggareau, St. Margaret, Twyford Biggareau, Werder's Early Black.

Peaches.—Alexander, Amsden's June, Brigg's Red May, Crimson George, Elberta, Foster, Hale's Early, Lady Palmerston, Late Crawford, Prince of Wales, Royal George, Salway.

Gooseberries.—Crown Bob, Roaring Lion.

Red Currants.—Carter's Black Champion, La Versaillaise.

TOP-DRESSING LAND FOR MAIZE CROPS.

A. J. Ross, Dairy Supervisor.

The small plot of maize illustrated (Sydney Flat Red) was planted the first week in December last and when the photograph was taken, 12 weeks later, it had attained a height of 11 feet. The only water used was when the plot was top-dressed with well rotted manures and then I went through the rows with a watering can only once. The top-dressing was done three times and helped materially in retaining the moisture. I am a firm believer in top-dressing land for maize crops, in dry seasons especially. The soil between the rows was raked to a depth of 2 inches every other day and in very hot weather every evening.

Previous to planting the only thing I did was to satisfy myself that there was sufficient lime in the soil. There were 9 inches of fair soil to work on with a quartz gravel subsoil.

Three stalks recently cut from this plot weighed 12 lbs. and a rough estimate of the weight of crop would be about 30 tons to the acre. The plot was sown to show sceptical dairymen that good crops of maize can be grown in Ballarat district.

Another plot of the same variety was sown two weeks later and in thirteen weeks the plants had attained a height of 13 feet. The seed was planted in rows 30 inches apart and 6 inches between each seed. The plot was top-dressed four times and was well cultivated between the rows. Two stalks recently cut from the plot weighed 20 lbs.

STATISTICS.

Rainfall in Victoria.

FIRST QUARTER, 1908.

TABLE showing average amount of rainfall in each of the 26 Basins or Regions constituting the State of Victoria for each month and the quarter, with corresponding monthly and quarterly averages for each Basin deduced from all available records to date.

Basin	January.		February.		March.		Total for First Quarter.	Average for First Quarter.
	Amount, 1908.	Average.	Amount, 1908.	Average.	Amount, 1908.	Average.		
	inches.	inches.	inches.	inches.	inches.	inches.	inches.	inches.
Glenelg and Wannon Rivers	0·44	1·51	1·17	0·77	2·12	1·55	3·73	3·83
Fitzroy, Eumerella, and Merri Rivers	0·45	1·64	1·63	0·89	2·47	1·82	4·55	4·35
Hopkins River and Mount Emu Creek	0·67	1·72	0·75	1·05	2·04	1·84	3·46	4·61
Mount Elephant and Lake Corangamite	0·61	1·79	0·62	1·16	2·15	1·86	3·38	4·81
Otway Forest	0·67	3·29	1·00	1·66	3·29	3·22	4·96	8·17
Moorabool and Barwon Rivers	0·49	1·57	0·57	1·22	1·99	1·55	3·05	4·34
Werribee and Saltwater Rivers	0·56	1·67	0·44	1·58	1·53	2·00	2·53	5·25
Yarra River and Dandenong Creek	1·10	2·79	0·81	1·70	2·52	2·44	4·43	6·93
Koo-wee-rup Swamp ...	1·01	2·71	0·86	1·39	2·40	2·21	4·27	6·31
South Gippsland ...	0·87	2·77	1·13	2·12	2·49	2·47	4·49	7·36
Latrobe and Thompson Rivers	1·14	3·05	1·06	1·92	1·84	2·33	4·04	7·30
Macallister and Avon Rivers	1·16	2·25	1·23	2·28	1·39	1·47	3·78	6·00
Mitchell River	1·22	2·79	1·49	2·94	1·15	1·49	3·86	7·22
Tambo and Nicholson Rivers	1·59	2·88	2·02	2·62	1·06	1·37	4·67	6·87
Snowy River	1·59	3·26	2·55	2·75	0·93	2·11	5·07	8·12
Murray River	0·48	1·31	1·55	1·37	0·53	1·68	2·56	4·36
Mitta Mitta and Kiewa Rivers	0·95	2·01	2·83	2·47	1·19	2·46	4·97	6·94
Ovens River	0·57	2·32	2·27	2·37	1·37	2·37	4·21	7·06
Goulburn River	0·75	1·49	0·80	1·29	0·82	1·65	2·37	4·43
Campaspe River	0·48	1·32	0·36	1·13	0·66	1·86	1·50	4·31
Loddon River	0·32	1·10	0·30	0·91	0·77	1·30	1·39	3·31
Avon and Richardson Rivers	0·1[illegible]	0·92	0·70	0·69	0·58	0·96	1·41	2·57
Avoca River	0·16	0·91	0·35	0·67	0·69	1·17	1·20	2·75
Western Wimmera	0·35	0·99	0·74	0·52	0·82	0·94	1·91	2·45
Eastern Wimmera	0·39	1·25	0·49	0·66	0·92	1·18	1·80	3·09
Mallee Country	0·21	0·88	0·85	0·76	0·60	0.87	1·66	2·51
The whole State	0·61	1·67	1·07	1·32	1·23	1·58	2·91	4·57

H. A. HUNT,
Commonwealth Meteorologist.

Perishable and Frozen Produce.

Description of Produce.		Exports from the State.		Deliveries from the Government Cool Stores.	
		Quarter ended 31.3.1908.	Quarter ended 31.3.1907.	Quarter ended 31.3.1908.	Quarter ended 31.3.1907.
Butter ...	... lbs.	9,578,492	15,895,132	6,392,064	11,422,433
Milk and Cream	... cases	8,610	7,742	...	1,137
Cheese ...	... lbs.	243,720	301,680	108,8 0	46,660
Ham and Bacon	... 〃	506,400	702,240	...	...
Poultry ...	... head	13,027	13,590	1,701	3,285
Eggs... ...	... dozen	5,100	6,480	10,090	17,013
Mutton and Lamb	carcasses	203,005	256,011	22,465	62,971
Beef	quarters	28	1,825	110	295
Veal	carcasses	1,074	877	201	..
Pork... ...	... 〃	402	778	23	364
Rabbits and Hares	... pairs	294,780	510,960	78,264	304,302
Fruit ...	... cases	90,642	127,513	3 962	7,861
〃 Pulp ...	... 〃	3,438	973	..	...
Sundries ...	... lbs.	...	...	34,725	16,581

R. CROWE, *Superintendent of Exports.*

Fruit, Plants, Bulbs, Grain, &c.

Goods.	Imports.		Exports.		Goods.	Imports.		Exports.	
	Inter-State.	Over-sea.	Inter-State.	Over-sea.		Inter-State.	Over-sea.	Inter-State.	Over-sea.
Apples ...	445	—	5,769	77,952	Plums ...	1,997	—	1,468	854
Apricots ...	685	—	1,486	260	Quinces ...	17	—	7	—
Bananas, b/s.	124,439	—	—	—	Tomatoes	7,884	—	—	—
Bananas, c/s.	7,160	270	121	68	Plants ...	40	139	2	29
Blackberries	352	—	—	—	Bulbs ...	3	311	2	—
Bk. Currants	4,465	—	—	—	Barley ..	30,680	78,789	—	—
Cherries ...	93	—	40	20	Beans ...	16	30	1,246	—
Cucumbers	1,127	—	3	—	Maize ..	2,721	—	—	—
Currants	3	250	250	—	Oats ...	12,055	16,142	—	—
Figs ...	2	9	589	—	Rye ...	72	—	—	—
Gooseberries	213	—	12	—	Wheat ..	3,315	—	—	—
Grapes ...	2,686	—	9	153	Nuts ...	170	1,379	26	—
Lemons ...	1,228	4,399	30	14	Nutmegs	30	32	—	—
Melons ...	66	—	—	—	Peas ...	3,946	216	178	—
Mixed fruits	27	20	—	13	Potatoes	103	—	15,062	—
Nectarines	2	—	—	3	Rice ..	—	42,871	—	—
Oranges ...	780	3,011	72	13	Seed ..	990	10,548	43	—
Passion fruit	512	—	3	5	Yams ...	—	307	—	—
Peaches ...	57	—	6,593	197	Cnd. fruit	—	—	—	10,371
Pears ...	335	100	23 706	3,135	Jams and				
Persimmons	26	—	—	—	Sauces	—	—	—	724
Pineapples	22,896	—	36	303	Drd. fruits	—	—	—	4,491
Total ...	167,599	8,059	38,719	82,136	Grand Totals	231,638	158,823	56,753	98,605

Total number of packages inspected for the quarter ended 31st March, 1908 = 545,819.

J. G. TURNER, *Senior Inspector Fruit Exports and Imports.*

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HINTS ON RAISING AN EXPORT APPLE ORCHARD.

P. J. Carmody, Inspector, Vegetation Diseases Acts.

LOCALITY.

Should any one be desirous of entering into the business of growing apples for export, he should take into consideration every factor that tends to cheapen production. There is no necessity to go into the mountainous regions of Gippsland, or the remoter irrigable areas of the northern part of the State, as land specially adapted for this particular purpose is obtainable at moderate prices within a few miles of the city. By purchasing land thus situated the payment of high railway freights and the expense of distant haulage to railway stations will be obviated. Select a locality in which the fruit industry is carried on, as you can then command skilled labor for your orchard, as well as being in a position to learn from the experience of others who are engaged in the same calling. Only those who are remote from a fruit-growing centre can understand the difficulty of obtaining the necessary trained labor.

Men must thoroughly understand their work. If not, the mistakes of one man follow those of another in endless succession until the owner retires from the concern in disgust. If properly and intelligently managed, however, there is no phase of agriculture so remunerative. The products from the richest and most fertile lands of the State cannot be compared to the returns from an orchard carried out on sound lines.

SITE.

When selecting the site for the orchard preference should be given to one having a gradual slope to the east or north east and if possible it should be protected from northerly and westerly winds by higher lands, or growing forests. If not thus naturally protected, it will be necessary to put in a hedge or break-wind at the time of planting out the trees. The slope should not be too steep or abrupt, particularly in the case of soils that wash away with heavy summer rains. The disadvantages of working steep country are too great, and add considerably to the cost of production.

But sloping land is necessary to permit of soil and atmospheric drainage. Late frosts not only destroy the vitality of the blossom, but also

interfere with the appearance of the fruit when set. Their effect on the fruit is somewhat similar to that caused by the use of too strong a spray. The apples become rusty, and, as the tissues expand with the growing apple, a well defined frost zone is impressed upon the fruit, and even if not mis-shapen its color is rendered unattractive. Frosts occur on calm, still nights. The warmer air rises, and the colder and denser air flows down the slopes to the lower levels. This air movement, to a very great extent prevents frosts, and the grower on the sloping land is more advantageously situated than the one in the valley, where the cold and frosty air is likely to be pocketed.

SOILS.

A good sandy or light loam with plenty of humus and a nutritive clay subsoil is, generally speaking, the most congenial for apple growing; though, amongst the different varieties, some will have a pronounced preference for different soils.

Between the surface soil and subsoil there should be no hard pan, as the fibrous roots of the trees in attempting to pass through such a stratum, perish, either by being choked in summer by its contraction, or drowned in winter. Nearly all the silurian and granite formations, and the alluvial soils dependent on them are exceptionally suitable for apple orchards. Land on which the peppermint, stringy-bark, messmate, and the she-oak grow, though poor in quality, is eminently adapted for fruit culture.

The texture or physical condition of the soil is more important than even its fertility. By the judicious application of chemical manures we can more economically increase its fertility than its mechanical activity. The absence of humus from sandy soils renders them too loose and leachy, and from clayey soils too cloddy. To supply this want, farm-yard manure must be added at regular intervals, or green-manuring operations carried out whenever required.

The subsoil plays a more important part in fruit growing than probably in any other phase of agriculture, since the roots of fruit trees feed at a much greater depth than those of cultivated plants generally. Hence, before setting out a plantation, it is imperative to determine the characteristics of the subsoil, as, upon its congeniality and suitability, to a great extent depend the life and vitality of the tree.

On the red soils which have no subsoils accessible to the roots of apple trees, this variety of fruit cannot be grown at all comparable to that grown on granite and silurian formations whose subsoils are rich in plant food. Trees on the red soils are immoderately rapid in growth, and uncontrollable even under the most skilful and practical management. They are so late in coming into bearing that the grower's patience is exhausted and his hopes destroyed, before he can secure a remunerative return. This at least has been the experience of growers who planted in such soils, and who had thought at the outset to have had ideal environments for the raising of apples. Whereas, trees grown on such soils as recommended above are kindly in growth, obedient to management, early in maturing, and generous in production.

PREPARATION.

Having selected his site the grower must be exceptionally particular in removing all the roots of native timber before planting, as from these the fungus *Armillaria mellea* spreads to the roots of the fruit trees, and, in a remarkably short time, causes their death. Throughout the State the

deadly track of this disease can be traced in numerous orchards by the presence of dead or dying trees between healthy and vigorous ones.

After this is done peg out your plantation in rows parallel with the slope, and 20 feet apart. Plough with a subsoiler attached to the depth of a foot or more. Do not turn up any of the subsoil.

Underground pipe drains should then, if funds permit, be put down midway between every two rows of pegs, and carried into a main open drain at the bottom. If this entails too great an expense, every second drain could be put down, until such time as the grower can afford to complete the operation. Without underground drainage growers cannot expect to establish an orchard of strong, healthy trees of uniform size. If not drained there will be numerous unprofitable trees throughout the orchard; such a leakage, in fact, that no business can sustain.

The depth and frequency of the drains depend on the nature and depth of the soil. In impervious and compact clays the pipes need only be placed in them sufficiently deep to drain the surface soil, but must be placed at such intervals as to insure this; in the more or less porous subsoils the drains may be deeper, and further apart.

When properly tile drained, the period of growth is lengthened, the winter temperature of the soil raised, moisture in summer maintained, and fertility increased. A greater depth of sweet congenial soil gives greater area for root pasturage, and cultivating operations can be begun and completed much earlier than would be the case if the ground were not drained. I regret that want of space prevents me in this article dealing fully with the advantages to be gained by underground drainage, and unfortunately there is no phase of fruit-growing so neglected, yet so important, by orchardists. Few, indeed, are the orchards so advantageously placed as to have a perfect natural drainage.

After lying fallow throughout the summer the land should be again ploughed in autumn, and reduced, by means of cultivators, to a state fit for planting. The most convenient as well as the most economical, distance between trees is 20 feet. Having pegged out the ground make the holes for the young trees deep enough to plant them the same depth as they occupied in the nursery. In this operation the subsoil should not be disturbed as it would then form a receptacle for soakage from the surrounding area, and in the retentive clay the water would remain and render the soil sour and uncongenial for the young trees to establish themselves. The medium in which the roots of trees feed, young or old, should not have even a suspicion of stagnant water therein.

Raise the centre of the hole slightly, and down the slopes trace the roots of the young tree as regularly as possible all round, keeping the strongest roots towards the weather side. Before doing this all injured and bruised roots should be cut off upwards with a sharp knife. Fill in with sweet well-mellowed soil, until the roots are well covered. Expel the air by trampling with the flat of the foot, taking care not to injure the roots. If the soil is poor, add now a couple of pounds of bonedust, or superphosphate and bonedust, by sprinkling it over the trampled surface, and complete filling the hole with the rest of the soil. The manure should, on no account, come in direct contact with the roots. If farmyard manure is available, either incorporate it well with the soil before filling in, or use it as a mulch.

The trees should now be tied to stakes to prevent wobbling with the winds, and thereby straining or breaking the tender fibrous roots that will shortly form. The bands with which the trees are tied should be soft

so as not to injure the bark or interfere with sap circulation. The stakes used should, if possible, be obtained from light saplings or ti-tree, as these will have rotted away by the time the trees have established themselves.

SELECTION OF TREES.

In selecting the fruit trees obtain them from a nurseryman who works with buds taken not only from trees that have fruited, but from trees that have proven themselves of good bearing character.

Selection here is as important as in the animal kingdom. One cannot expect to raise profitable trees from parents that have seldom, if ever, yielded a remunerative crop. It is well known that scions partake of the characteristics of the parents from which they have been taken, as well as being subject to the influence of the stock upon which they have been worked. Hence it is as necessary, in selecting trees, to give as much importance to the scion as to the stock. For standard trees the Northern Spy stock or Winter Majetin is the best. Both are blight proof. See that the trunks are low, straight and sturdy. On the poorer parts of the plantation put the strongest trees, or those having the best root system.

VARIETIES.

As different varieties of apples have decidedly preferential tastes as regards soils and climate it would be impossible to specify here the varieties that should be selected for any particular orchard. But it is intended to point out some of the characteristics of the most prominent kinds of export apples, and any person wishing to engage in the business can, by reference thereto, and from what he can learn of their habits in his own immediate neighbourhood in the older orchards, come to a satisfactory selection.

All things considered, the *Jonathan* heads the list. It thrives well under a wide range of climate and soils, and in this respect is, probably, more cosmopolitan than any other kind. It does not do too well in the dry, arid regions of the north, even when irrigated. With fair and generous treatment it bears regularly year after year Its fruit is of uniform, moderate size, high color and good quality. It comes into bearing early in its life, is easily controlled, and remains profitable for a lengthened period. If shipped and carried under anything like reasonable conditions it realizes high prices on the London market. It is the variety most sought after by exporters.

Cleopatra is a good grower and heavy bearer. Its fruit, however, is so subject to Bitter Pit in the southern portion of the State that I certainly would not take the responsibility of advising anyone to plant it. In fact I would advise the contrary. Up north it is, to a great extent, free from this complaint, and is amongst the most profitable varieties grown. It commands a high price in London.

Munroe's Favorite (Dunn's Seedling) is another northern district variety. In the south it so scurfs and cracks in normal seasons that it is unprofitable to grow. This peculiarity increases as the tree gets old, and the fruit has a great tendency to fall off. It is a strong grower, and good cropper under suitable conditions. Fruit is of good color and excellent quality.

London Pippin (Five Crown) is one of our southern apples, but its behaviour the past three years is anything but commendable. It blooms late, and is the severest sufferer from the ravages of the thrip. Under

normal conditions it crops well. It grows rapidly and naturally shapes itself. It thrives best in well drained soils, where there is no hard pan, as often occurs in the poorer lands. Its price in London is generally such as would pay, but unless it redeems its lost character I should discard it.

Rome Beauty, like the London Pippin, blooms late and receives the attention of the thrip. It is somewhat late for export, and does not command a price commensurate with its quality. It is somewhat difficult to manage, and very susceptible to woolly aphis. It is a good local variety.

Esopus Spitzenberg is a vigorous grower but generally a very shy bearer. It is supposed to be partially self sterile, and therefore requires planting adjacent to a variety that blooms at the same time. The fruit is of good quality and color, and the price in London payable if it were to bear even fair crops.

Cox's Orange Pippin is a weak grower, somewhat of the character of the Jonathan. It is subject to "bark blotch," and requires forcing. It is not comparable to Jonathan in bearing. Crops lightly. Fruit excellent in flavor and good color.

Rymer grows abnormally large unless controlled. Crops every second year heavily. Fruit good color but no quality. Commands moderate prices.

Dumelow's Seedling (Wellington Pippin) crops heavily every second year. It has a tendency to overbear and the fruit is consequently small unless the tree is well thinned out, and fed liberally. The fruit is excellent for jelly and a good "cooker." It is rather acid for the general taste. This variety brings a fair price in London.

Reinette du Canada is a vigorous grower, and biennial cropper. It thrives best on sandy soils. It belongs to the cooking varieties. Last year it was a favorite in the German markets, but its price in London was discouraging.

Statesman is a strong upright grower, and on granite formations yields heavy crops of splendid color. Somewhat late for export, and subject to Black Spot in autumn.

Bismarck is a weak and straggling grower. Requires being kept more upright, otherwise has a tendency to overbear and dwarf. Fruit is very susceptible to Black Spot. It is good bearer, but prices in European markets are not too promising.

Annie Elizabeth is so subject to Bitter Pit that it should not be grown south of the Divide.

Plan of Orchard.

The orchard should be so planned out in sections as to insure the most economical advantages in working as well as to secure interpollinating influences. The varieties blooming about the same time should occupy either adjacent sections, or two or three rows of the one you wish to predominate should intervene between two rows of another variety. By this means interpollination can take place and when spraying and picking come round they can be carried out with greater facility than would otherwise be the case.

To secure success eventually, every tree should each year record at least standard progress, so that when the orchard comes into bearing the owner will have, as far as possible, trees of uniform size, vigor, and reproductive capability. We cannot but expect a few weaklings amongst some hundreds of trees when we know that, in the beginning of the young tree's life, it had to undergo two serious operations—one of root-grafting,

the other of budding. If any of these weaklings should prove unresponsive to special treatment during the first couple of years they must be replaced by more vigorous ones of the same varieties. There are other causes for trees not thriving, but these become local problems, due, probably, to local conditions, and must be solved by each individual grower for himself.

Every orchardist should aim at raising such a tree as will be capable, on its coming to maturity, of giving the maximum return, so that during its early life its potentiality should be considered, its health conserved, and its frame developed to this end.

CULTIVATION.

In the spring succeeding planting plough away from the trees six or eight inches deep. Plough not deep enough to injure the roots when near the tree, increasing the depth as you get free from the roots. This method tends to establish a deep root-system, and prevents injury later on. The whole of the orchard need not be ploughed, but a strip about four feet wide on each side of the trees, as this is sufficient for root extension the first year. To allow of further feeding area for the roots the width of this strip must be increased, each succeeding year, by a couple of furrows on each side. The young trees will require thorough cultivation at regular intervals during summer, so as to maintain normal growth. In autumn plough somewhat deeper and up to the trees, and leave it in a rough state, to permit of the ameliorating influences of winds, rains, and frosts.

Varying the depth of ploughing in autumn and spring enables the grower to maintain the same depth of cultivation throughout plant life, besides obviating the formation of a plough pan caused by constantly ploughing to the same depth. The subsoil is continually imbibing nourishment and moisture from above, and the intervention of a plough pan prevents the access of these to the root-system of the trees. The plough pan also interferes with the interchange of heat that is constantly taking place between the surface and subsoil.

Cultivation of the young orchard must not be overdone. All that is necessary is to keep the trees growing continuously, and moderately vigorous, during the period of active growth. If the trees are making too rapid growth cultivation must cease, as strong wood growth one year gives subsequently small fruit crop. In order to permit the leaves to ripen cultivation should cease two or three weeks preceding the occurrence of frosts.

There is a period in the bud's growth when it is waiting for food necessary to define its character. Any stimulation to the roots due to cultivation or other cause at this time will drive it into wood growth. The lowering of food supply by the stoppage of cultivation or by cultivating so as to dry out the moisture modifies sap flow, and thus causes leaves to ripen, and form fruit buds. When sap is elaborated to form fruit buds there is little moisture in the soil. So, by intelligent cultivation spur formation can be controlled to a great extent, and trees that are making abnormal growth can be brought into bearing.

When once trees are bearing cultivation should be increased, for the production of a crop entails a dual function on the part of each bud, viz. the supply of nourishment necessary to the development of its fruit, and the production and maturing of a fresh fruit bud to bear fruit the succeeding year. In order that the buds may be able to perform these functions thoroughly they must have plenty of food, and therefore the plant-food inherent in the soil must, by cultivation, be rendered available for the roots to take up.

No portion of the orchard should remain untilled. By means of a false head to the plough and a long chain the ploughing can be done right up to the trees in most cases. What cannot be done this way must be accomplished by hand. During summer the surface soil should be kept in as fine a state of tilth as possible to conserve the moisture. The smaller the particles of soil can be rendered the greater the capillary attraction, and the films of moisture surrounding these particles reduce the plant-food to a soluble state by which the roots are enabled to obtain nourishment for the wood and buds above.

No encrustation of the surface should be permitted in summer after rain. The soil, whenever this is likely to occur, should be lightly stirred with a cultivator.

Of course, as before explained, cultivation varies as the requirements of the orchard demand. When trees are bearing heavily, we cannot be adjudged guilty of over-cultivation.

When the orchard is young, growers are often found producing cereal crops between the trees. This is a great mistake. An ordinary crop of hay is computed to take about 300 tons of moisture out of an acre; and as this hay is cut off in late spring the fruit trees begin their summer in a dry and thirsty soil. Owing to the want of moisture the food that is in the soil is unavailable to the roots of the trees. If the orchardist must grow something, a few rows of potatoes or strawberries or other crop that will require frequent summer tillage may be grown, but at such a distance from the trees as not to interfere with their roots.

The primary object, that of establishing an orchard profitable throughout a long life, must not be lost sight of. Time is too short to rectify serious errors in the establishment of an orchard, so do not woo returns from catch crops, probably at the expense of your fruit trees hereafter. Many have done so, and wish they had not.

MANURING.

As a rule the young orchard requires, if any, but little manure. It is a mistake to have to amend root treatment with the knife. All the grower wants in his young trees is standard progress—even, moderate growth. If his trees are not doing this for him 2 cwt. of bonedust to the acre will remedy matters. But when his trees come into bearing they will require liberal and intelligent feeding.

Owing to the variability of soils even in the same orchard it would be useless to give here any special treatment for any one orchard. The grower must study closely the behaviour of his trees, the surrounding circumstances that may modify their growth or their bearing, and by experience—the only infallible guide—determine and supply their requirements. He must understand that the tree requires every element of plant food, and soils rich in any one of these elements in an available form are not visibly benefited by its addition in an artificial form. In fact, only those constituents in which the soil is deficient should be added in the form of fertilizers. By the soil's deficiency in any particular constituent is, of course, meant when that constituent is unavailable to the plant.

Concentrated fertilizers though strong in chemical quantities are lacking in physical action, and should be regarded only as supplementary to thorough tillage and green-manuring.

The incorporation of organic matter with the soil, as in the case of green-manuring, ameliorates its physical condition. It influences the warmth and moisture of the soil, alters its mechanical constitution, and renders it in a better state for the appropriation of food by the plant.

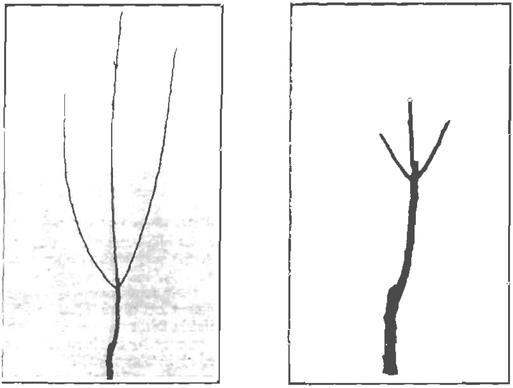
Lime in low form added to the soil has no mechanical effect, but when quicklime is added at the rate of 30 cwt. to the acre it has mechanical action by forming gases and causing movement and air passages.

As nitrogenous manures supply food essential to wood growth, it follows that if, in the early life of the orchard, trees are making insufficient progress this constitutent must be supplied them. The aged tree, also, debilitated through bearing, is more responsive to nitrogenous manures than to any other kind. The grower can tell when his trees demand this particular food by their pale, sickly leaves, and weak wood-growth. Trees grown on soils rich in nitrogen have dark green foliage which they retain late into the autumn. Any deficiency in this respect in the soil can be readily amended by the application of farmyard or green-manuring.

When we consider that an ordinary crop of fruit will take two or three times as much phosphoric acid and potash out of the soil as an ordinary crop of cereals, it is clear that these constituents must predominate in manuring a bearing orchard.

PRUNING.

The pruner must have in his mind at the outset the form of the tree he wishes to establish, and preference must be given to the shape that is capable of carrying the greatest quantity of fruit. He must build up a strong tree capable of supporting whatever crop it may bear.



1 AND 2. CLEOPATRA APPLE, JUST PLANTED, UNPRUNED AND PRUNED.

If the frame of the tree is made too weak, and this is often the case, the first moderate crop it is called on to bear either distorts it, or breaks it down. If this happens the tree has to be rebuilt, and the grower loses time and money. Should he, however, start with a strong, substantial framework, he can build up his tree to carry the heaviest crop without

unduly straining the wood. This will be his aim for the first three or four years; nor, in doing this, need he sacrifice the early fruiting capabilities of the tree. By the retention of selected lateral growths which will not enter into its permanent construction, temporary crops may be obtained, until such time as matured fruit spurs are developed where they are required.

A month or so after the tree has been planted out it will be necessary to head hard back to outside buds, leaving three, or at most four leaders. See illustrations 1 and 2. The leaders are cut to outside buds. Had there been strong buds lower down, and in the proper position, it would have been preferable to have cut them still further back. Owing to this hard cutting, the leaders sweep away at a much wider angle than if lightly headed, and give a greater base upon which to build the future tree.

The grower will require to continue this system of hard cutting back for three or four years until he has got his trees well spread and well shaped. Each year he will retain the most appropriate wood for new leaders, and place these as equidistant as possible from one another, but leave plenty of space between for the circulation of light and air.

The leaders should break away from the trunk at different heights, otherwise when the tree comes into bearing there will be too great a strain upon it and this may cause it to split. Care must be taken not to let a heavy leader run away straight up the centre of the tree. If so, its strength is gained at the expense of those on the outside. The centre should be kept

3 AND 4. JONATHAN APPLE, 4 YEARS OLD, UNPRUNED AND PRUNED.
Laterals *e*, *d*, and *c* are temporarily retained. Can be removed when required.

well opened out at first. It can easily be filled in with suitable and more fruitful wood afterwards.

When the orchardist has established as many leaders (10 to 14) as he ... he will then require to head back much more

lightly than before, nor will it be advisable at any future time to increase this number of leaders. The grower must understand that the greater the number of leaders the greater the facility for sap leakage, so that to maintain fruit spurs in the base of the tree the top must be well open. The leaders should be trained at such angles as will conserve their fruit buds. If they are carried out too horizontally they will eventually lose their spurs on the underside.

Every year the leader should be headed back, otherwise fruit spurs will form at the top, produce fruit, and either break down the leader or drag it permanently out of position, and rob the spurs down at the base. Instead of this system developing and maintaining fruit low down in the head of the tree it has just the contrary effect (see *b*, *c*, page 396), where

5 AND 6. JONATHAN APPLE, 5 YEARS OLD, UNPRUNED AND PRUNED.
Lower laterals retained temporarily.

the spurs have all been lost towards the base through bearing at the end, and developing other spurs near the top. The leading or highest bud has strongest attraction for the sap, then the next, and so on downward. From this it will be seen that as soon as the topmost buds are capable of receiving the amount of sap flowing no further spur development will take place. This is exemplified again in *b*, *c*. The four long spurs at the top and the short bud further back were equal to taking up all the sap moving along the leader *b*, *c*, and thereby starving the other buds all along the line. By cutting at *c* the lower buds would have been developed.

When the leaders, or any of them, are making too vigorous a growth they can be checked by changing their direction frequently and blocking the course of the sap. If you bring water in a drain straight down a hill, it rushes unimpeded in its course to the bottom, but if the same volume of water is brought down in a drain of similar capacity in a zig-zag manner down the slope, never allowing it any long stretches for rushing,

its velocity is diminished, and it frequently overflows in its course. Now the sap circulation can be controlled in the same manner. Sap circulates with varying velocity, being rapid in young and sluggish in old trees. Young trees, therefore, require a more spreading design in order to retard sap movement, while old trees require the contrary.

Sap movement can be retarded by giving it a more or less tortuous passage. On referring to illustrations 3 and 4, it will be seen that the leader, *a*, is growing upright, and vigorously in consequence. Its direction is changed at *a*, where the sap is compelled to stop, as the piece, *a b*, is much smaller, and is incapable of receiving the volume of sap that arrives at *a*. The sap is thus dammed back, and nourishes and develops buds below this point, or produces laterals that can be manipulated so as to

7 AND 8. JONATHAN APPLE, 6 YEARS OLD, UNPRUNED AND PRUNED.
Frame of tree completely formed.

produce fruit. By thus twisting or deviating the course of the sap from the straight rushes in a zig-zag manner it can be made to nourish buds where they are most required. Growers often follow, year after year, the strong leading growth in the same direction, and have as a result abnormally tall trees, and fruitless for years.

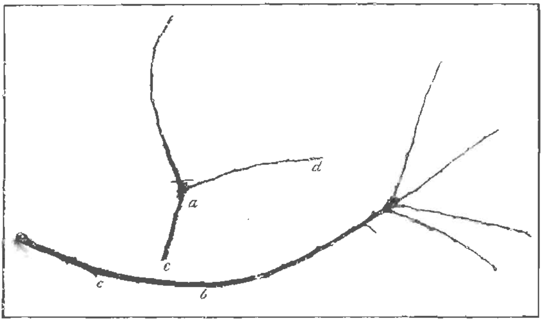
Do not forget that if your trees are making too strong a growth, change the direction of the leaders and thereby compel the sap to move more slowly, but great care should be taken not to torture the leaders by deviating them too much from their natural habits. Rapid sap circulation causes wood growth, and slow circulation tends for fruit

TREATMENT OF LATERALS.

Jonathan and Rome Beauty are prone to throw out numerous light lateral growths, and the grower must be careful of the treatment of these. Near the base of these laterals there are blind "eyes," and if the pruner cuts back to one of these the remaining portion dies right back to the leader.

Remove the heaviest laterals and those growing upright. Leave in the light and more horizontal ones. As the sap circulates more slowly in these dependent lateral lines they will, during the year, furnish well with fruit spurs. The next year they bear, and the year after can be cut back, if necessary, to a fruit spur for its development.

The Rome Beauty lateral on bearing at its terminal, clubs, and throws out simultaneously two shoots, one stronger than the other. (See *d*, *a*, *c*, in illustration.) If not cut, fruit will be borne at *d*, and no spur development will occur between *a* and *c*. The strong shoot should be cut out where marked. The piece *a d* cannot then receive all the sap moving along the lateral, and spur formation takes place at, and back from *a*. The shoot *a d*, after bearing, can be cut out, and thus further strengthen the buds in *a c*.



9. PRUNING OF LATERALS.

a. Position where sap is checked and fruit spurs are formed. *c*. Position where *b* should have been cut the previous year to build up fruit spurs.

By allowing laterals to run a year or two and then working them back is the best method of dealing with this kind of fruiting wood. This is the method adopted in the pruning of the various trees illustrated. The lighter leaders have freedom for rapid sap circulation while those that were too vigorous have been treated in the manner already explained. By this means leaders of uniform size will be obtained. The laterals have been either left or cut back as necessity demanded, and the trees well opened up to permit of the free circulation of light, heat, and air to ripen the leaves.

This is most important, as ripened leaves mean ripened fruit buds. The function of the leaves is to elaborate the sap into wood-building tissue and fruit-bud products. No fruit-bud can be built up without the aid of the leaves. On the character of the leaves depends the character of the buds, and, consequently, the character of the fruit which these buds bear. Small, weak, and sickly leaves, consequent upon bad drainage, starvation, or other cause, give weak and undeveloped fruit buds.

Leaves are far more active in sap elaboration in sunlight than in shade, so that every opportunity should be given to the leaves to perform their

work by well opening up the tree. Leaves, and consequently buds, require to be largest and strongest at the base and the underside, so as to bear fruit of equal size with that towards the top.

No defective connexions between the different parts of the tree must be established by the introduction of unripened wood often caused by summer pruning when the wood has not time to ripen. Ripened wood has ribbed bark and little pith, unripened is soft and pithy. Apple wood of normal growth requires 16 to 18 weeks to ripen: of strong growth 18 to 24 weeks.

The bark of trees should be prevented from becoming hard and dry, as in this state it acts as a ligature, checks sap movement, and causes dwarfed trees. Rough bark is thick, and denotes strong constitution, while smooth soft bark is thin and sensitive.

Pests and Diseases.

Without reference to the pests and diseases that the young orchard may be subject to, and the means to contend with them, this article would be incomplete.

Woolly Aphis.—The woolly aphis so insiduously and silently establishes itself that the grower must continually be on the alert for its presence. At the beginning of its attack it is very easily dealt with, if prompt measures are adopted. Unfortunately, orchardists, when dealing with this pest, lack thoroughness. They forget that so enormously rapid does the insect reproduce its species that a single female is capable of becoming in the one season the genetrix of such an army of its kind as will infest the whole orchard. This being so, no half measures will meet the case. Absolute and complete eradication must follow the efforts of the grower who expects to be successful against it. An emulsion of crude petroleum oil at a strength of 1 in 10 is the best spray. Dabbing it on with a brush, a common practice, is altogether unsatisfactory, as the insect works on the underside of the branch, and by this means the material cannot be properly applied. The spray pump with a bent nozzle should be used, and the sprayer must keep his nozzle close up to the part he is spraying, using plenty of force to drive the material into all the little crevices in which the insect has become lodged. A fortnight after, the trees sprayed must be carefully examined, and, if any insects remain, again treated in a similar manner. Another inspection after a similar interval should be given, and should any be then found it is quite evident that the insects are protected by projecting bark from the action of the spray. This bark must be cut away, and the part infested treated as before. It would appear that this process entails a great deal of labor, but after the first spraying the insect will be localised to the few parts passed over, and to places protected from the spray.

Petroleum or red oil emulsion is made thus:—Boil one gallon of water and 2 lbs. of soft soap until the soap is dissolved. Add two gallons of whichever oil you wish to use and bring to boil. Place nozzle of spray pump into this mixture, and by pumping in the air you violently agitate it for three or four minutes until it emulsifies. This will then mix with cold water just like milk in tea. Use at the required strength.

Many growers have great difficulty in getting the oil to mix, but I have never found the above method fail when soft water has been used.

Codlin Moth.—No grower should neglect to take every precaution against an invasion of the codlin moth. Old second-hand cases are the

principal media of distributing this pest throughout districts in which the orchards are some distance apart. If, however, the moth be introduced, the most determined effort ought to be made to stamp it out on its first discovery. The grower himself should examine every fruit at least once a week, and, if affected, pull it off, and destroy the grub. This work is too important to be deputed to the ordinary workman. If this is done thoroughly it will save labor and losses in after years. If the codlin gets a hold, then spraying and bandaging must be carried out. The arsenate of lead spray has given excellent results. Spray first when the petals have fallen, watch closely for the appearance of the eggs on the fruit, and spray then at intervals of ten to fourteen days. As the habits of the insect vary under different climatic conditions, the method of treatment as regards the frequency of spraying and the time of its application must vary accordingly. The resourceful and observant grower will find this out for himself.

Arsenate of Lead spray should be made as follows:—Boil slowly and keep well stirred for half an hour, 1 lb. of white arsenic, 2 lbs. of washing soda and 1 gallon of water. Dissolve 7 lbs. of acetate of lead in three gallons of warm water. Add the arsenic solution to the lead and stir up thoroughly. This quantity is sufficient to make from 360 to 400 gallons of spray.

If the grower should be afraid of burning his foliage he can determine the effect first by spraying a part of a tree and letting it remain for four or five days, when, if too strong, the foliage will show any injury occurring. Arsenical sprays act differently under different climatic conditions.

Apple Scab or Black Spot.—This disease is so amenable to the Bordeaux mixture that the successful grower now sustains very little loss. The orchard should be sprayed with the Bordeaux when the majority of the blossoms have separated so that the spray can run down along each little stem, and before the petals have expanded.

The formula for the Bordeaux mixture is 6 lbs. bluestone, 4 lbs. fresh unslacked lime, 50 gallons of water. Slack the lime with small quantity of water and then make up to 25 gallons. Dissolve bluestone in 25 gallons of water. Run evenly into third vessel through strainer. Stir well and apply with fine spray.

Bark Blotch.—In the case of bark blotch the tree must be kept growing vigorously and the wood attacked should be cut out.

EFFECT OF COLD ON NEW DRY WINES.

The following important paper has been translated by Mr. M. d'A. Burney and forwarded to us by the courtesy of Messrs. P. B. Burgoyne & Co. Mr. Burney in bringing it under the notice of Mr. Burgoyne writes as follows:—

"A pamphlet from the pen of Dr. P. Carles, a most prolific and interesting French writer upon wine matters, has been sent to me, and believing the suggestions it contains to be specially applicable to Australian conditions, I have made a translation for use on your Mount Ophir vineyards. Necessarily prejudiced by his surroundings and by the immutable belief that good wine can come from nowhere but his native district Dr.

Carles does not recognise the bare possibility of any other sized cask than the hogshead being advantageous. In Australia we know otherwise and can leave the question on one side while considering the most useful remarks upon the value of cold in the storage of new wines. With her unrivalled climate for the ripening of grapes Australia suffers (from a cellarman's point of view) from periods of great heat which are very trying to all wines, but more particularly those of the preceding vintage. With a sudden fall in the barometer and a violent increase in the temperature the lees rise and there is every prospect of bacterial diseases affecting and destroying the quality of the young wine.

By a natural provision of nature, fortunately, nearly all wines made in such climates have a sufficiency of alcohol to enable them to withstand the heat, but at the same time they may for the same reason contain traces of sugar which is a food for many injurious germs. While possessing great substance and body it is remarkable how very few Australian wines will stand age in bottle. The reason is not always easy to find but in Dr. Carles' pamphlet there is his opinion as to the necessity of cold which points distinctly to the weak spot in Australian systems of maturing. New wines are but rarely bright before the summer and whenever there is a lack of limpidity there is a danger of secondary fermentations and deterioration. Inevitably fermentation during the summer following the vintage entails a certain loss of quality and keeping powers.

Having experimented with the action of artificial cold at the Government Cool Stores, Melbourne, through the courtesy and kindly assistance of Mr. R. Crowe, Superintendent of Exports, I can speak from personal experience of the extraordinary effect of prolonged cold on new wine. A new red wine of the 1904 vintage was run into a hogshead and laid up in a cool chamber for three weeks at a constant temperature of 33°. It was then racked from its lees which were very voluminous and compact and sent back to Rutherglen where it was bottled the following year in perfect condition. At the time of bottling, which was of course far too soon, the wine appeared fully a year older than the same wine stored in the ordinary way but had far more delicacy and, particularly, finish. There was no earthiness or coarseness and the general improvement was very pronounced. I was desirous of ascertaining the exact degree of cold and the duration necessary to produce this result but was prevented by circumstances over which I had no control. The fact remains that steady and severe cold is eminently beneficial to the keeping qualities of young wines. If Australia means to take her place among the famous vintages of the world all difficulties must be faced and overcome. Summing up Dr. P. Carles' suggestion we should expose new dry wines to the greatest cold available. As soon as the first fermentation is complete in a month or so after vintage, if hogsheads are available, they might be filled and stacked in sheds or out of doors out of the sun or the cellar doors should be left wide open. If casks have to be seasoned this is our opportunity. Then in July our wine can be racked and above all clarified before the large storage casks are used for the summer. If early clarification were made an essential every year the improvement in quality would, I think, be most marked and the insurance against defects and loss very considerable."

The Effect of Cold on New Dry Wines.

Dr. P. Carles, Professor of Medicine at the University of Bordeaux.

The past autumn has been unusually mild and therefore all who hold stocks of 1907 wines should take every precaution that these wines should

benefit by the cold of the winter. This is the more important as last vintage was generally carried out under defective if not disastrous conditions. For this reason many new wines still want watching and will require all the winter cold to enable them to withstand the heat of next summer.

The action of cold upon new wines is of such importance that *every wine which does not get chilled when new, suffers continuously and often for many years.* This is especially so after wines have been bottled. Refrigeration of wine is the more useful when it follows soon after the first fermentation, when it is prolonged, and when the degree of cold approaches 32° Fahr. The cold acts not only in freeing the wine from an excess of tartar but in depositing along with it, oxydised tannins, albumenoids, various ferrous, and ferric combinations as well as many other which are *in a state of pseudo solution. It is these substances, of which the equilibrium* of solution is the more unstable as the temperature is lowered, which destroy the limpidity of the liquid, and which give a dirty, stale and flat taste to the wine fermenting its proper appreciation. But in addition to the insoluble matters easily distinguished by the taster there are also noxious microbes or microscopic germs which are the primary cause of all diseases of wine. They are also affected by cold when it is sufficient as they are put into a state of inaction and while in this inert condition are precipitated with the other substances above mentioned into the lees. This fact is so well known in practice that rackings always take place before the winter is over, because if there were further delay these microbes rendered again active by the warmth of the spring would rise from the lees and reinfest the wine and deteriorate it more or less. This action can only be complete when the wine before racking has been subjected to the action of progressive cold, sufficient in degree, and fairly prolonged. Now in ordinary storage of new wine the question is whether these conditions are fulfilled.

In the Gironde, which has a very old reputation for the successful handling of wine, hogsheads are traditional. If the custom is old and firmly rooted it is certainly because this type of cask has numerous advantages. No doubt from its size and shape the hogshead is easily handled. It is strong enough not to be easily broken and yet the thickness of the wood is of the right measure to moderate the evaporation through its pores. It is also averred that this thickness is exactly right to limit the diffusion of air to the interior by the same pores. But what has been until now neglected is that its volume allows complete access of cold to enable this latter, in an average year, to cause complete clarification in cask. We must remember that this depositing of the lees, &c., can only take place if the hogshead is sufficiently exposed to the cold so that it reaches the wine itself. Formerly there was no need to pay much attention to this point. Old brokers say that no purchases were made until after spring racking or at any rate that until then the wine was not moved. To-day this is not the same, as growers take more heed of the dangers of heat than of the benefit of cold. That is why, at our suggestion, many cellars for new wine are now fitted with double doors, one in thick close fitting wood and the other in trellis work iron. When cold is considered useful the trellis work doors only are closed. In the country we have even advised stacking hogsheads in the open air and the same has been even carried out in courtyards, &c., in towns. It is to be supposed that the system is successful as all who try it continue it every year.

This system is of course specially useful for wines for sale when young. No system is more economical, better adapted, and more efficacious

for cleansing young wines from all that is detrimental to their proper preservation, limpidity and stability. Nothing can better prepare them for proper maturing which comes to them healthy and strong and not worn out or affected by disease.

Now if hogsheads are specially suitable for this purpose it must stand to reason that larger casks are not so. Fermenting vats have sometimes been fitted with heads and used for storage at a time when there was a dearth of hogsheads. Considering the thickness of the wood and the increased volume it must be at once admitted that the action of cold will be slow and incomplete. Therefore the wine will clarify badly or not at all. When the great heat comes the chances of disease are greatly increased and often the wine has to be got rid of at distillation prices. Brick and cement vats and tanks are also sometimes used but have the same disadvantages as wooden vats from our point of view.

These special vats are excellent for fermenting in and even for finishing the ageing of wines once they are clarified. For new wines, however, our preceding remarks will have sufficiently explained the situation. Kept from the cold the new wines never get bright, form but little lees, and keep most of the tartar and with it albumenoids and others of which we have described —the inevitable precipitation in a normal winter. For the same reason noxious microbes, instead of being paralysed by the cold, remain in suspension in an active state so that at the spring racking none are left behind in the lees, and with the arrival of the hot weather these wines acetify easily, become bitter, greasy or oily. Sent in hogsheads to the consumer they may stand some little time but sooner or later wear away, perish and become worthless even to keep in bottle.

The large storage casks used on the Mediterranean coast have the fault of generally allowing the wines put in them to pass the summer badly, and hence perhaps a reason why these wines are always passed upon the market very young. This inability to withstand the heat of the summer is caused not only by local high temperatures and defectively constructed cellars but through the capacity of the large storage casks. This capacity prevents the cold of the winter producing clarification, the more so as the cold is in itself very slight in this climate.

It is probable, however, that if these same wines were run into hogsheads and if they were exposed to the same natural cold of the winter that they would stand the summer when put back into large casks. We believe, however, that on account of local habits and customs growers would prefer to keep to their large casks and use artificial cold. In conclusion the preservation of new wines in all climates is only certain *when during their first six months they have undergone the action of cold sufficient both in intensity and duration.* This cold is necessary to remove, at the next racking, the germs of disease and other insoluble matters. Every new wine which has not been subjected to sufficient cold cannot keep well unless pasteurised, but we must not forget that pasteurisation does not prevent it depositing in bottle.

SELECTION OF MAIZE SEED.

J. M. B. Connor, Dairy Supervisor.

The following particulars are supplementary to the article on *Maize Growing Experiments* published in the March number of the *Journal*. The opinion amongst practical farmers is almost universal that it is desirable to change the seed from time to time to prevent degeneracy. This opinion is no doubt based on practical experience and observation and is in keeping with the results obtained from the varieties of seed maize experimented with by me.

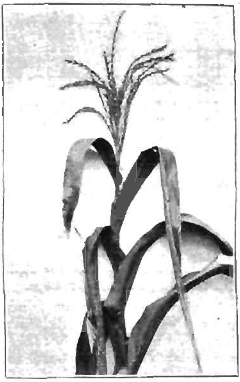
THE "TASSEL" (MALE FLOWER). THE "SILK" (FEMALE FLOWER).

In most districts there are some advantages to be gained in introducing seed from outside sources, that is, from where that particular variety of seed grows at its best. Such selected seed will probably be possessed of more inherent vigor than that grown in the locality into which it has been introduced. Different varieties of seed produce plants possessing very marked differences in respect to individuality. Whilst carrying out the experiments it was observed that, although the plants were grown from the same variety of seed, the characteristic differences could be readily noticed, and the most suitable plants for either fodder purposes, or seed, fixed by selection. The seed from the best of such plants for either purpose should be kept for future sowing, thereby securing the type of maize most suitable for the district.

It is only by close observation whilst the plant is growing, that one can thoroughly understand the important part the tassel or male flower and the silk or female flower (see first illustration) play as the reproductive organs of the maize plant; each has an equal influence as regards the qualities and characteristics of the grain produced. The pollen from the tassel is conveyed to the silk by bees or the wind. The silk is composed of long

delicate silky threads, each one of which is connected with what will, when fertilized, eventually become a grain of maize. Knowing this, it is imperative that any unproductive plants like Fig. 2 should be discarded and uprooted if the quality of the seed is considered before their pollen has had an opportunity of contaminating the silk of any of the prepotent and desirable plants as shown in Fig. 3. This would be the first step to obtain productive seed for future sowing thereby doing away with the barren plants that would transmit their undesirable qualities to the growing crop and produce a larger proportion of barren plants.

In growing maize for seed it is necessary that the plot selected for that purpose should be at some distance from the general maize crop; otherwise it is likely to become hybridised by the aid of the pollen blown by the



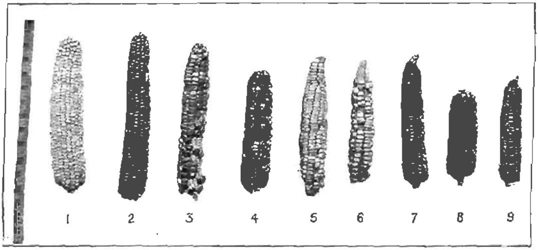
2. A STERILE MAIZE PLANT—TASSEL ONLY, NO COBS.

3. A FERTILE MAIZE PLANT SHOWING TASSEL AND TWO COBS.

wind from the tassels of the main crop on to the silks of the seed plot. As "like begets like," it is necessary to select seed from what are known to be productive ears and heavy yielders, as they are likely to be more prepotent and to have the power of influencing and transmitting any good qualities they possess to the plant grown from that selected seed. If the silk does not become sufficiently pollinated the result will likely be an imperfectly filled ear as shown in Fig. 4, cobs Nos. 3 and 6.

Cross breeding, that is, when seed is sown of the same variety of maize but obtained from different cobs, is desirable, as there is then every probability that the seed from such a cross will be furnished with vigor, individuality and productiveness. What is wanted in growing maize for seed purposes is to establish a hereditary tendency to become prolific in yield. It is therefore necessary to remove the tassels from all barren stalks, of course, before the pollen has ripened, and also to remove them from single-eared stalks, so that the pollen of the male element will come only

from the more prolific plants. The fine ear is but one characteristic, and by merely selecting typical ears from the seed plot, we may get the typical ears and along with them other characteristics that are undesirable. The breeder who neglects to study the whole plant during the whole of the growing period, and to preserve his best plants from contamination will never make a success.



4. MAIZE COBS—4 MONTHS AFTER SOWING OF SEED.

1. Boone County Special. 2. Triumph Flint. 3. Yellow Moruya. 4. *Victorian Flat Red.* 5. *Hickory King.* 6. *Sydney White Horse Tooth.* 7. North-Western Dent. 8. Sydney Flat Red. 9. Ninety Day.

Every grain on the cob is an individual fruit and the result of an individual female flower—the silk. The silks are fertilized and the grain set by the pollen that blows in miniature clouds from all the stalks around, and the chances are many that every grain on the ear has had a different male parent. In selecting a plant for seed and quantity per acre, it would be better to select one with two medium sized ears on the stalk, in preference to one large ear, as the two medium sized ones are likely to return more seed than the one big one. Before the plants come into tassel those that show weakness, such as a deficient growth, should be marked and as soon as the tassels show the latter should be pulled out before the pollen appears. In the same way detassel all undesirable stalks, such as those with suckers, barren or smutty stalks, or other blemishes. In order that inbreeding may be prevented detassel one-half of each row in the following manner:—

Row 1 .... ——————————

" 2 —————————— ....

" 3 ....

" 4 —————————— ....

After the seed is carefully selected and tested, the selection and planting of the plot requires careful attention. It should be of good degree of fertility, but extra care should not be given, since seed grown under such favorable circumstances might not produce so well when planted in the general field.

THE IMPROVEMENT OF CEREALS BY SELECTION AND CROSSING.

(*Continued from page 291.*)

D. McAlpine, Vegetable Pathologist.

II.—Crossing.

As already pointed out in treating of Hallett's "pedigree-cultures," there is a limit to the possibilities of selection even when the best grain of the best ear of the best plant is continuously chosen for propagation. The wheat plant may be nourished to its fullest capacity, but it can only absorb a certain quantity of food material and produce a number of grains which it cannot exceed. If more were attempted the vegetative powers of the plant would be overtaxed or its nature would require to be completely changed. Still the highest possible average is an improvement. But when this highly developed plant is crossed with another variety, always assuming that the choice of parents has been judicious, it is claimed that further improvement may be effected.

It has to be remembered that the wheat-plant is self-fertilized; that before the florets have opened, the pollen, which produces the male element or sire, is deposited on the so-called female organ of the same flower and fertilization is the result. The weakening effects of this perpetual in-breeding have been counteracted by the constant artificial selection of the best; but when new blood is introduced by means of a suitable cross, then the whole system of the plant is re-invigorated.

The cross-fertilized plant is sometimes called a cross-breed or hybrid. It is a recognized practice now to apply the term "hybrid" to all individuals which arise from a cross between parents, no matter whether they belong to distinct species or represent only different races or varieties. Many writers, however, including Darwin, distinguished between the off-spring resulting from species and that from races or varieties of the same species, restricting the term "hybrid" to the former and applying the term "mongrel" to the latter. The use of the general term hybrid will allow of the principles of breeding to be included under the general heading of Hybridization.

We will first of all consider some of the practical results of crossing, as obtained by some of our successful breeders, and then endeavour to understand the principles on which they are based. "The aim of crossing is the combination of the desirable qualities of two or more species and varieties into one strain and the elimination of undesirable qualities." The combination of the beneficial qualities and the elimination of the detrimental qualities by breeding out is the chief end in view, and it is in this combination of characters that the novelty lies.

But while the production of new varieties is one of the objects of crossing, it is not the only one, and perhaps the most important is to infuse new vigor into an existing variety and thus improve it. In the case of wheat, where self-fertilization is the rule, the crossing between different plants of the *same* variety, either when grown under similar conditions or better when grown under different conditions, gives rise to stronger and more productive offspring. By a judicious selection of parents, the type

may be strengthened in every way, and Darwin has shown this improvement in a number of cases, expressed in actual figures and extending even to the tenth generation.

As practical breeders of cereals, particularly wheat, we have had the late Mr. Farrer, of New South Wales, whose numerous crosses in cultivation speak for themselves. As early as 1886, he began experimental work, and in his paper on *The making and improvement of wheat for Australian conditions*, he gives full details as to his aims and methods. Fortunately his work is being continued by his former assistant, Mr. Sutton. As already mentioned Mr. Pye has done good work in Victoria, where also some of the cross-breeds raised by Messrs. Carter and Garton of England have been tested and are still being grown.

GARTON'S RESULTS IN CROSSING.

It will serve our present purpose to call attention to a few of the remarkable results obtained by Mr. Garton at Newton-le-Willows and Acton Grange, England. To begin with he collected as many seed-grains as possible from all parts of the world and had them growing in his experimental fields as the necessary material for cross-breeding. Among them he had a wild wheat from Southern Asia, of no commercial value in itself, but holding its grain with great tenacity. On crossing this with an otherwise desirable wheat, but liable to shed its grain, he remedied this grain-shedding defect. In the case of barley, there is a fibrous covering to the grain which has to be removed before it can be used for food. This is done by mechanical means and the grain is converted into "pearl barley" at a loss of 25 per cent. of the food content. By crossing the ordinary commercial barley with "Nepaul barley," which has a loose skin that breaks away during threshing and is not bearded, Mr. Garton was able to produce a barley of the finest quality, and the grain suitable for ordinary food purposes after threshing without any further mechanical treatment. The two-rowed barley has also been experimented with and converted into a six-rowed barley, the four rows of sterile flowers having been rendered fertile. The wild oat (*Avena fatua*) is well-known to possess a vigorous constitution, to stand the severest winters, and to be very strong in the straw and to ripen early. It would evidently be an advantage to have these qualities added to the already improved oat where necessary. Mr. Garton sought to combine them by crossing, but found that the wild oat did not cross directly with the cultivated oat. He therefore secured a wild variety of French oat with which it combined, and in this indirect way was able to mate it with the cultivated oat.

These are a few of the possibilities open to the breeder of cereals. Although the artificial cross-breeding of plants had been carried out in a systematic way since the middle of the 18th century, beginning with Kölreuter, and the breeder of animals had made considerable improvement in his types by intercrossing, and although numerous observations had been made upon the behaviour of hybrid plants and animals, yet until quite recently there was no general principle to bind together the scattered facts. There was no predicting beforehand what was going to happen, and the results of practical experience were the only guide. There was an air of secrecy and mystery often about the breeder's work, as if it were something not reducible to law and could only by practised by someone specially gifted. The mating of animals or plants was a simple matter, but the seemingly

erratic way in which characters appeared in the offspring was confusing and the very plasticity of the organism induced by the breeder's art seemed to be inexplicable.

MENDELISM.

It is only within comparatively recent times that the manner in which characters are transmitted in hybrids has been properly understood so that precise scientific methods can be applied to them.

It is found that they follow in the main a simple rule which has been experimentally proved over and over again, and the law to which they conform was discovered by Mendel about 1865, and the principle is called Mendelism after its discoverer. Mendel began his experiments in hybridization with the common edible pea, because it fulfilled the conditions he considered necessary. In the first place it possessed differentiating characters or points, and in the second place it could easily be secured against foreign pollen. As regards differentiating characters, he dealt with the following seven pairs and traced their inheritance separately for each pair:—

(1) Seeds—smooth or wrinkled.
(2) Seed coats—deeply coloured (grey) or nearly colourless.
(3) Cotyledons or seed-leaves—yellow or green.
(4) Pods—green or yellow.
(5) Pods—inflated and stiff or wrinkled and soft.
(6) Flowers—scattered or in a terminal bunch.
(7) Stems—tall (6-7 ft.) or dwarf (1½-2 ft.

The crossing of the pea-flower is simple as it is fertilized by its own pollen and insects are not necessarily concerned in it, as in the case of wheat. In a young flower before the anthers containing the pollen have burst, they are removed with their stalks by a fine pair of forceps and the flower is enclosed in a Manila paper or muslin bag until a day or two later. Then the top of the pistil is dusted with pollen from the flower of the so-called male parent and it is closed up again in its bag until it has set seed. The pollen produces the sire and the ovule produces the dam, so that the pollen-bearer is not strictly the male, nor is the ovule-bearer the female parent but they are often erroneously spoken of as such. Mendel cross-fertilized his peas once, and then noted the result for each pair of characters during several generations and the results were remarkable. Crosses, for instance, were made between tall and dwarf varieties which had been proved to breed true to these characters and the result was in every case the same, no matter which was the pollen-producing and which the seed-bearing parent. It is often asserted that the hybrid resembles the pollen-bearing parent more closely as regards its flowers, but shows greater affinity to the seed-bearing parent in its foliage. Careful experiments, however, prove that the results are the same when reciprocal crosses are made. Tall plants resulted in every case and as they were evidently the dominant partner, he called them *dominants*, while those of the dwarf habit receded from sight for one generation at least and he called them *recessives*. The seeds were all gathered and sown next season, the flowers being allowed to fertilize themselves and both tall and dwarf plants appeared but there were none half-and-half. The tall plants were about three times as numerous as the dwarfs and this proportion of three to one was found to hold good in several experiments. Next season all the seeds were sown as before and from the seeds of the dwarfs only dwarfs grew, while the seeds of the tall were not all of the same nature. The seed of some of them produced tall plants only and the seed of others produced both talls and

dwarfs, that is they produced tall and dwarf offspring in the ratio of three to one, as in the case of the second generation of the original cross. The results may be summarized as follows for three generations:—

Parents— Tall × Dwarf

1st Generation— Tall (hybrid)

2nd Generation—Tall (pure) Tall Tall Dwarf (pure)

3rd Generation—Tall (pure) Tall Tall Tall Dwarf Tall Tall Tall Dwarf Dwarf (pure)

(Ratio, 3 Talls to 1 Dwarf, and 1 pure Tall to 2 impure Talls.)

The parents were a pure tall, fertilized by the pollen of a pure dwarf, but it did not matter as to the result which was the pollen-producing and which the seed-bearing parent. For subsequent generations the pure talls and the pure dwarfs always bred true, and the hybrid talls always gave tall and dwarf in the proportion of three to one, while of the talls, one was pure and two impure.

UNIT CHARACTERS.

From the general results of his experiments, Mendel was led to the idea of *pairs of unit-characters* and that each germ-cell can carry one of such a pair but not both. He conceived the idea that the germ-cells of the male (or pollen-cells) and female (or egg-cells) in a hybrid plant, each contained one or other member only of any pair of unit characters and that each member or factor of such a pair of characters is represented in an equal number of germ cells of both sexes. Further, separate pairs of unit-characters obey the law independently. Thus the germ-cell in the hybrid pea represents either a tall or a dwarf but not both, and half of them represent the tall and half the dwarf character. In the pure-breeding tall pea, the germ-cells only represented the tall factor and those of the dwarf only represented the dwarf factor. Now if we consider the result of the union of say 20 male germ-cells with a similar number of female germ-cells, 10 of the 20 male germ-cells would be "tall" and 10 "dwarf" and the same with the female germ-cells. As half of the germ cells are "tall" and half "dwarf," there is an equal chance of 5 of the "tall" male cells meeting and mating with 5 of the "tall" female cells, and the same with regard to the dwarfs. So that the final result would be:—

5 Tall meeting Tall
5 Tall meeting Dwarf
5 Dwarf meeting Tall
5 Dwarf meeting Dwarf
or a total of 5 Pure Talls, 10 Hybrid Talls and 5 Pure Dwarfs.

It is generally assumed in breeding that hybrids show characters intermediate between those of the parents, but carefully conducted experiments prove that this is only one of many possibilities. If a red-flowered pea, for instance, is crossed with a white-flowered pea, the hybrid is not a light-red but red like one of the parents. Red is *dominant* over white and

the proportion of red to white in subsequent generations is similar to that of tall and dwarf, as shown in the following scheme:—

Parents— Red × White (flowered)

1st Generation— all Red

2nd Generation —Red (pure) Red Red White (pure)

3rd Generation—Red (pure) Red Red Red White Red Red Red White White (pure)

There is here the proportion of one pure red to two hybrid reds and one pure white. That this will be roughly the proportion is seen by taking counters, such as red and white slips of paper, to represent the red and white-flowered respectively, and placing 50 red and 50 white in one hat and the same number in another hat. By drawing one counter at random from each hat and arranging the pairs according as they are red and red, red and white, or white and white, it is found that they approximate to this proportion. In my test with counters, in the first fifty pairs there were 12 RR, 22 RW and 16 WW, and in the second fifty pairs there were 14 RR, 24 RW, and 12 WW. The total proportions were 26 RR, 46 RW and 28 WW and the larger the number of trials, the closer will the proportion approximate 25 RR (pure reds) 50 RW and 25 WW (pure whites). That the germ or sexual cells of the hybrid carry the unit characters or *initials*, as they are sometimes called, in a pure and not blended condition—that they are segregated or sorted out in the pollen-grains and egg-cells—has been proved by numerous experiments and in this simple fact lies the key to the explanation of the varied phenomena of crossing.

From this conception of unit-characters the individual must now be regarded from a different stand-point. Instead of regarding the individual plant as a unit, we have now to conceive it as made up of separate independent characters and the aggregate of these constitutes the individual. The individual is thus a living mosaic and if we removed all the separable characters we would in all probability come to the vanishing point.

This conception of distinct unit-characters is similar to the assumption of atoms in chemistry, and like atoms they are regarded as indivisible and they serve as a tangible basis for showing what happens when hybrids are produced. We have already given an illustration of what happens when tall and dwarf characters and red and white-flowering are blended in peas. The cross-fertilized plant produces its seeds as usual and when these seeds are sown the progeny is not quite what one would naturally expect. In the examples given, instead of being intermediate in height or light-red in flower, they are all tall and all red and when the seeds of the first generation are sown again, the result is a mixture of tall and dwarf or red and white in certain proportions. All the possible forms have now appeared in the second hybrid generation, which is often called the variable generation, and a certain proportion of these forms is already fixed. If the breeder saves the seed from each plant separately he will be able to indicate the fixed individuals.

There is thus a great contrast between the first and the second products of crossing. The first products may have characters intermediate between the two parents, or they may resemble one more than the other, but whatever the change is all the seeds have it alike, so that the products appear exactly alike. But the second products, instead of being moulded

after the same pattern, exhibit every conceivable combination of parental characters; they may take after one or other of the parents or they may strike out into new lines. And there is a further important consideration in the fact that, amid the multiplicity of forms, the two original parental types are among them. It is often argued against cross-breeding that it destroys the fixity of the type, that it breaks up the combination of desirable characters in the original strain at the risk of securing nothing better to take its place. But in the third generation he can now recover the fixity of his original types with all the added vigor resulting from a cross.

Farrer in speaking of the wheat-plant says—"When two varieties of different types are crossed artificially, although the plants from the seed which are made by crossing may and generally do resemble one another closely, the plants from the seeds they produce usually differ in almost every detail, some most likely, proving to be bald, and others bearded: some quite rust-liable and others rust-resisting; some early and others late: some with stout straw and others with slender; some being tall and others short; some with long ears and others with short—differ, in fact, in almost every quality."

The breeder takes advantage of all this variation, selecting such forms as possess the desirable qualities he is striving for and rigidly destroying all those forms that are undesirable. The whole secret of the breeder's art lies in the use he makes of these varying forms, for he knows that by selective breeding, by choosing the natural variations suited to his purpose, he can afterwards render them constant. It is by crossing, selecting and fixing that he attains his ideal and the greatest of these is selecting, for he must first make a judicious selection of the parents to be crossed and afterwards select the best from the products of the cross.

Mendel's law is applicable to animals as well as plants, but it is not of universal application, and it is rather premature to say that because a certain result happens in the breeding of races of plants, that a similar result will follow in the human race.

BREEDING FOR RUST-RESISTANCE.

But we are more concerned here with the facts which Mendel discovered than the interpretation he put upon them and a practical illustration may be given. Biffen of the Agricultural Department of Cambridge University has been working upon the improvement of cereals, particularly of wheat, and has been carrying out the principles enunciated by Mendel. He has shown that following the pairs of characters in wheat follow the Mendelian law, the dominant character being placed first in each case — beardless and bearded ears, red and white chaff, presence and absence of hairs on chaff, and red and white colour of grain. He has also applied the principles with success, from a commercial point of view, in two different directions, in the one case to rust-immunity and in the other to "strength" of flour.

Let us take the rust problem as an example. There are at least three different kinds of rust which attack wheat, the Black rust (*Puccinia graminis*), the Brown rust (*P. triticina*) and the Yellow rust (*P. glumarum*). Only the two former occur in Australia and it is the so-called Black rust which is so injurious in certain seasons, while the Brown rust is comparatively harmless. It appears that in Britain and America the Yellow rust does considerable damage and it is the one which has just been made the subject of exact experiment by Biffen. He found in his plots a strain of wheat which was immune to this rust, for although under observation for

four seasons and surrounded by varieties susceptible to the disease it remained free and showed no trace of infection. This wheat belonged to the sub-species *Triticum compactum* or Dwarf wheat. On the other hand there was a type known as Michigan Bronze which was so liable that not a single individual escaped and very few ripe grains were obtained.

On crossing these two types, the first generation consisted of plants badly rusted without exception, even the awns and grains being affected, but fortunately a number of ripe grains were obtained for subsequent sowing. Every available grain was sown to produce the second generation, in plots alongside the parent varieties. The result was that while every individual of the susceptible variety was affected and the immune variety escaped entirely, the cross-breeds were mostly badly rusted, but certain individuals stood out perfectly clean, not showing signs of disease even in the withering basal leaves.

The second generation of the cross-breed was thus composed of plants either badly rusted or immune, and the exact numbers were 1,609 diseased and 523 immune, or a ratio of 3.07 to 1. Further, the immune plants bred true to that character, showing that they were fixed and the rusty showed one part fixed and two parts unstable, so that the ratio of 1 : 2 : 1 held good, or one part with one original character fixed, one part with the other original character fixed and two parts unfixed.

The result is shown in the following scheme:—

Parents— Rusty variety × Immune variety
(Michigan Bronze) (*Triticum compactum*)

1st Generation - Rusty

2nd Generation— Rusty (fixed) Rusty Rusty Immune (fixed).
1609. 523.

This practical experiment shows that the pair of characters—immunity and susceptibility to rust—behave like other pairs of characters, and that in three generations it is possible to obtain by crossing a variety immune to rust with the desirable qualities possessed by either of the parents.

By selecting from among the immune plants of the second generation the individuals which combined the best characteristics of Michigan Bronze and sowing the seed, the breeder is able to fix the type in the third generation. With the simple conception of unit-characters and their mode of inheritance, the breeder can now proceed in his work with a definite aim in view and with a certainity as to the means to achieve it. He can build up character by character in the plant he is dealing with, until he has obtained his ideal, and experience will teach how far he may go without exceeding that amount of variation which is compatible with stability. He can now base his practice upon fixed principles, in the one case on the principle of selecting elementary forms or plants with individual peculiarities to start with and in the other of breeding for separate unit-characters and fixing his attention on one primary characteristic at a time.

Sports or Natural Crosses.

In the careful experiments at Svalöf where a large number of groups were grown each descended from a single mother-plant, the offspring of each parent was uniform. But there were occasional exceptions to this rule and the differences could not be explained as the result of stray seeds

getting accidentally mixed with the others. This difference might be due to a variation occurring naturally or to a natural cross. In a natural variation, the progeny might either revert to the original type, or the variation might be repeated generation after generation and become permanent, when it would be regarded as a "sport." In the case of a natural cross, there would be in the second or variable generation, quite a multiplicity of forms and not a single variation as in the so-called "sports." Which of these three alternatives is to be accepted? At Svalöf the differences were regarded as being due to natural crosses, as the splitting up of the hybrids afterwards was proved by special experiments.

There are some, however, who maintain that it is impossible for a cross to occur except by artificial means from the very structure of the ear of wheat, and there are certainly a number of obstacles to be overcome before it can take place. Still in cases where from any cause the flower fails to be fertilized by its own pollen—whether from the anthers proving abortive or the pollen unfertile—natural crossing does occur and the Thrips is probably the unconscious carrier of the pollen. To test this, Farrer emasculated all the flowers of an ear while the anthers were still quite green and left the flowers exposed to impregnation from the outside. The result was that 84 per cent. of the flowers contained seeds. Natural crosses have been recorded by accurate observers such as Dr. C. E. Saunders of the Central Experimental Farm, Ottawa, and Rimpau, a famous breeder of cereals, still although so rare it is a wise precaution in crossing, to protect the florets operated on, both before and after the application of the pollen.

DETERIORATION OR DIMINISHED YIELDING CAPACITY.

It is a recognised fact that a variety of wheat, whether produced as the result of careful "selection" or by means of "crossing" has a tendency to degenerate in course of time, to lose its pristine vigor as shown by a diminished yield. And an important point to settle is, having secured a good strain, how is it to be maintained in full vigor and prevented from deteriorating or "running out" as it is called. It is not a question so much of improving the type as of keeping it up to the standard.

If one knew in each case the cause of this deterioration, then it would be a guide to the best methods of counteracting it, but unfortunately at present we can only surmise. When new breeds are produced by artificial fertilization, for instance, the original vigor of the cross deteriorates under ordinary cultivation and in a few years the yield decreases. This is supposed to be due to the continual in-and-in breeding in the case of wheat and the remedy evidently lies in renewing the cross. In order to arrest this diminution in yield, individual florets are selected for crossing each year, and a stock is raised from the grain produced by repeating the cross, which is called by Garton, who has adopted this method, "Regenerated Stock." Various tests have been made under similar conditions with seed from the Original Stock and that from the Regenerated Stock and in every instance the yield was increased, sometimes even to the extent of 25 per cent. in the case of oats.

This seems at first sight to be a very successful method of maintaining the standard of efficiency, but it does not show by any means that in-and-in breeding is the sole cause of the falling off in yield. It is rather a reflection on the efficacy of crossing that it requires to be repeated so soon. In fact it is evident that there are various causes for the deterioration and

it is more reasonable to suppose, in the absence of experimental evidence, that the normal and natural self-fertilization of the wheat plant does not account for such rapid diminution in the yield. Notwithstanding all that has been written about the advantages of crossing and the disadvantages of self-fertilization, it must be remembered that there are drawbacks to the one and compensating advantages to the other. In the case of a natural cross, if the pollen is brought from an inferior plant, or from a plant low in vitality, then the resulting cross will have a tendency to degeneration. Instead of increased vigor there may be diminished vitality, and deterioration may be due to undesirable crossing. On the other hand, the self-fertilized plant such as wheat, runs practically no risk from undesirable crossing and the in-and-in breeding to which it has so long been accustomed, does not seriously affect it within a reasonable time. If its vigor is maintained, the natural mode of breeding is not likely to impair it. And this suggests another method of maintaining the yield, which would probably do away with the necessity for regeneration, and that is to select the seed wheat so that only the best are sown and all inferior grains rejected. The larger seeds with their greater food supply will give the young plants a much better and more uniform start than the smaller seeds. It is just as likely for a strain to run out from the want of careful and intelligent methods of seed selection, as it is from the inherent defect of self-fertilization.

It has been pointed out elsewhere that when the large seed from the large ears was sown, it was 25 per cent. more prolific than the mixed sample of the same variety, and this is equal to the increase obtained from repeating the cross. In the latter case the profit of producing the regenerated stock is in the hands of the seedsmen, while in the former, the farmer can select his own seed wheat. There is still another means whereby the vigor of the type may be maintained and deterioration arrested and that is by crossing different individuals of the variety to be improved. It may seem at first sight, as if it were a hopeless task out of weakness to produce strength, but the mere operation of crossing, in plants long accustomed to self-fertilization, infuses new life and vigor into the offspring—rejuvenates it, in fact. It is often stated that the mere growing of a variety in the same locality year after year tends to produce deterioration and the evident remedy is a change of seed. No doubt a change of seed, if it is a better seed, will likely do good, but if the variety has become adapted to local conditions, selected graded seed would be likely to prove a sufficient change from ordinary seed.

MEASURES FOR INCREASING THE YIELD.

If we confine our attention now, in conclusion, to the definite object of the improvement of our wheat yield, there are various factors which must be taken into account, in addition to the skilful cultivation of the soil, a proper rotation and the use of suitable manures.

1. Selection of Varieties.—It is a well-known fact that some varieties are much better adapted for certain conditions of soil and climate than others, and this has led to the very common practice of variety testing. It is only by growing different varieties for several years under similar conditions and alongside those generally grown, that their suitability or otherwise can be determined and their superiority shown in increased yields. It is a most interesting and instructive sight to see a large number of

varieties grown together and observe their various peculiarities—their length and strength of straw, their liability to stool, their time of ripening, their variously shaped heads, their susceptibility to frost, hot winds and rust and their shedding or holding of the grain, together with its quality. The difference in yield is just as varied as in other qualities and there is a decided advantage in having a large number to choose from. This variety testing has been carried on for a number of years and has appealed to the practical farmer.

2. *Selection of Seed-Wheat.*—Even the ancient Romans knew the advantage of choosing their seed from the largest and fullest ears, but apart from this, the selection of seed from the general crop should be carefully done. Bright clean plump grain free from blemish should be chosen and the germination is then even and regular. Next to choosing a suitable variety it is most important to have specially selected seed. It is well-known that large and well-formed seed produces strong, vigorous and productive plants. It has been experimentally proved that plump seed is superior to shrunken, that sound seed has the advantage over that injured in the process of threshing and that thoroughly ripened seed is to be preferred to immature.

From experiments conducted by Mr. Pearson in connection with the work of the Intercolonial Rust in Wheat Conference, it was found that large seed yielded 21 per cent. more grain at harvest time than small seed and that the seed taken from large heads yielded 25 per cent. more than seed taken from small heads. And to prove the advantage of grading the seed wheat, a mixed sample of large and small was 25 per cent. less prolific than the large seed taken from the large heads only.. Similar results have been obtained by Dr. Cobb in New South Wales and from the general experience in other parts of the world it may be positively affirmed that grading of seed by suitable sieving machinery is a most important factor in the improvement of the yield of cereals.

3. *Selection of Individual Plants.*—It has already been sufficiently insisted on, that if the best results are to be secured, individual plants must be chosen on account of their superior excellence from which to select the seed for the improvement of varieties. This insures that the progeny will be pure, being descended from a single mother-plant, and that it may be grown true to the type without further selection. By selecting the best seed from such chosen plants, improved strains are often secured and when submitted to the test of experiment it is invariably found, that the yield of grain from seed obtained from selected plants is greater than that produced from seed obtained from plants not selected. The mistake is sometimes made of selecting extra large ears, irrespective of the plants by which they are produced, but this may be due to plants otherwise unproductive bearing little else than the one large ear. It is the mother-plant which determines the constitution of the progeny, and it is the differences among individual plants on which selection is based.

4. *Production of Hybrids.*—Selection of suitable varieties and selection of the best individual plants from among these, will go a long way towards increasing the yield, and some consider that this is quite sufficient for ordinary needs. But there are always some weak points even in our best varieties that we wish to get rid of or to strengthen—they may not be thoroughly adapted to our conditions, or they may not produce the quality of grain we want. To eliminate the weak and strengthen the good qualities and give an added vigor to the new strain is the object of making a cross. Crossing itself is a comparatively simple matter but it is the work of

selection which necessarily follows and has to be continued for several years, that requires time and attention. And the results of crossing, too, are rendered much more certain from a better understanding of the principles underlying it, so that hybridizing is no longer what Lindley considered it, "A game of chance played between man and plants."

The improvement of our grain crops is thus seen to be a work involving careful and systematic effort, directed along definite lines, and from its very nature must be continuous. If the finest plants are selected from suitable varieties, the largest ears chosen and the seed graded so that only the best grain is sown, the average yield could be increased by this means alone. New varieties also require to be produced by cross-breeding, not merely to give us strains with the weaker characters eliminated and as many of the best characters as possible incorporated, but in which such serious diseases as rust and smut have been got rid of by breeding from an immune parent.

Though careful and systematic work in cross breeding and seed selection will give us, in the course of time, cereals with an increased yielding capacity, full advantage of the improvements will not be obtained unless accompanied by a higher standard of farming. In the hands of the careless, a rust-resisting or smut-proof wheat, or indeed any improved seed, would in a few years cease to be pure and soon sink to the level of the general average of the varieties now in cultivation. Just as the introduction of the binder and the harvester has necessitated increased mechanical skill in the farm worker to utilize their possibilities to the full, so also these new or improved varieties will demand better cultural methods on the part of the general run of our farmers. Hearty co-operation between the experimentalist and the farmer is the only sure way to ultimate success.

JOURNAL OF AGRICULTURE, VOLUME I.

The Department is at present unable to supply full sets of the parts forming Volume I. of the *Journal of Agriculture.* These were issued gratis to producers and as it is probable that some of the recipients may have no further use for them the Editor would be pleased to receive any available copies of Parts 1 to 7, published in 1902, from January to July inclusive. Returns should be addressed to The Editor, Department of Agriculture, Melbourne.

THE PROCLAIMED PLANTS OF VICTORIA.

(*Continued from page 352.*)

Alfred J. Ewart, D. Sc., Ph. D., F.L.S., Government Botanist; and J. R. Tovey, Herbarium Assistant.

The Hemlock.

Conium maculatum, L.

The Hemlock is a native of Europe and Asia. It is a poisonous plant whose leaves emit a peculiar mouse-like smell when rubbed. The Fools' Parsley (*Æthusa cynapium.*L) has a similar disagreeable smell, but it is a smaller annual plant a foot or two high, with bright green leaves, and the bracts beneath the flower clusters bent downwards, which is unusual in Umbelliferæ. In the Hemlock there are also usually three bracts beneath each flower cluster but they are turned towards the outside of the cluster and not bent downwards. It is an erect annual or biennial often over 5 feet high, with large much divided leaves and ten to fifteen rayed compound terminal umbels, each main umbel with a variable number of green bracts at its base. The fruit (b and c) is flattened and has five ribs on each side.

The Hemlock is a common garden escape found in waste places and fields in several parts and it has been widely grown in gardens as the carrot or parsley fern. It recently was responsible for the poisoning of a number of cows at Warrnambool and also for the death of a child at Clunes. Fortunately its smell usually repels stock and children but the plant is highly poisonous owing to the presence of the poisonous alkaloid coniin most abundant in the seeds but also present in the leaves and stem. Goats appear to be largely immune to the action of the poison and will graze on it when hungry.

Fools' Parsley is less poisonous but still dangerous when present among fodder. Being an annual it is easily suppressed by preventing the formation of seeds, by cutting, hoeing or cultivation. The same applies to the Hemlock, although its eradication is more difficult, since it may last for two years. On waste ground it is best pulled up, piled and burnt and the ground if possible kept covered with other vegetation to prevent it becoming re-established. On cultivated ground it gives no trouble, though apt to spread along hedges, the borders of fields, the banks of streams, &c. Here, cutting it down should be done, and the seed in the soil, being short lived, will soon be exhausted.

Proclaimed for the whole State.

PIG BREEDING IN VICTORIA.

W. Smith, Pig Expert.

The fact that we are fully 20,000 pigs short this year induces me to bring under the notice of the farmers the importance of breeding more pigs of the right sort. My lectures throughout the State during the past year have been well attended, but I now wish to use the *Journal* as a means of reaching those who were unable to be present when I visited the various districts. For several months past the prices ruling in Melbourne markets

PLATE 26.

C. Walter, Del. A. J. Ewart, Direx. J. Kemp, Govt. Printer

for pigs have been higher than has been the case for 40 years, prime pigs bringing as much as 6d. per lb., and sometimes 7d. per lb. It is therefore highly important to pay more attention to this very remunerative class of stock, the value of which, apparently, has not yet been fully appreciated by our farmers.

In the matter of breeding, I cannot too strongly emphasize the superiority obtained by mating pure Berkshire and Yorkshire hogs (beyond doubt the best of the English breeds) with half to three-quarter pure-bred Yorkshire and Berkshire sows respectively. Such a cross produces exactly what is wanted; a fine class of pig is obtained which matures quickly, puts on flesh rapidly, is thrifty, and altogether proves the best paying animal to breed. Bacon-curers and butchers prefer them before all others because of their shapely conformation, thickness and texture of flesh, and smallness of bone. Such a pig is the most suitable both for local and export requirements. As a separate class the Berkshire holds pride of place, and has long been in favor, but the Yorkshire is of such excellence that it cannot but occupy a prominent position, for the eye of the judge is at once attracted by the type of perfect breeding and sound constitution represented. The sows, too, are very prolific breeders, and farmers cannot go astray if they confine themselves to these two lines for breeding purposes. Last year I purchased a pen of crossed Yorkshire and Berkshire pigs at the Melbourne market for £3 16s. per head. They were only five months old, but had evidently been full feeders from birth, and when killed weighed 140 lbs. apiece. With two such litters a year, is there any other branch of farming so remunerative? I think not. Twenty pigs from Dookie College, of the Yorkshire-Berkshire cross, and just over five months, were also sold in the open market last year, and went even better than those I purchased, for they averaged £4 4s. per head.

As far as housing accommodation is concerned, it has to me always seemed cruel to stye up pigs in low-roofed pens. Pure air costs nothing. Every owner should have a barn-like structure, say, 32 feet long, 10 feet wide, and 14 feet high. This should be divided into sleeping apartments, with outside feeding yards, the floors of the whole being bricked and sloped for drainage. Both in summer and winter stock need pure air and healthy surroundings, and you cannot expect them to be healthy or clean if confined in small stuffy styes, and filthy muddy yards. Bedding may consist of straw, ferns, or leaves, which will also prove invaluable as manure after it has served its purpose. Farmers will find that pigs amply repay for care and attention given, and the small expenditure incurred in providing proper accommodation is more than made up by the increased constitutional vigor and robust health of the occupants of the stye. Remember, too, that when parents are sound and healthy, they transmit soundness and health to their progeny.

Now a word as to feeding. The farmer can utilize almost everything grown on the farm, and afterwards top off his pigs with peas, skim-milk, corn, &c. Feed regularly twice a day, and always keep a supply of charcoal and rocksalt near the troughs. If farmers wish to secure quick returns they must keep their pigs in condition from the time they are weaned, for the young pigs convert a much greater proportion of their food into flesh than do those full grown. Pigs fully fed from the time of weaning and kept in condition will, when five months old, realize top prices in the markets, which is infinitely better than keeping them on as stores.

LUCERNE HAY FOR FATTENING EXPORT MUTTON.

H. W. Ham, Sheep Expert.

In order to profitably fatten sheep on lucerne hay and grain, the following three important essentials should obtain:—1. The holding must contain enough suitable lucerne land and a liberal supply of water for irrigating it. 2. Suitable racks and grain troughs for the economical feeding of the hay and oats must be provided. 3. There must be a larger supply of shapely quick-thriving breeds of store weaners and two-tooths than we now have.

Farmers who can make lucerne hay and grow oats, need have no fear but that this ration will fatten sheep quickly. Stud sheep men in Riverina and Victoria have proved it, and in Tasmania fair numbers of sheep are successfully fed on perennial and Italian rye grass hay with a little oats added; lucerne hay is, however, much more fattening.

Lucerne hay feeding should be one of the chief methods of fattening sheep for export. It will not be used to any great extent in connexion with raising milk lambs, but at present it points to one of the ways of getting ready, as teg mutton, those not fattened in adverse seasons as milk-lambs, and also the store lambs from cold country not milk-giving enough to raise an export lamb on the mother with natural pasture. It will then be possible, with the asistance of the very late districts, to keep up a fair supply for our freezing works well on towards autumn, and will, in more ways than one, assist to avoid the rush of lambs that takes place each spring when the freezing companies cannot take them fast enough and the lamb-raisers suffer accordingly. Better prices could be given for even quality lambs, whether milk-lambs or tegs, if the supply would come more regularly.

The best grain to add, for feeding value, is oats (Algerian for preference). Some feeders of merino stud sheep do not agree with this, and are in favor of peas or barley. Oats (especially Algerian) are liable to cause stripping of the legs and face, and to put rather much color in the yolk; so will lucerne hay, but this is no disadvantage in export mutton, as the breeds best suited are mostly bare faced and legged. Oats will grow anywhere, yield well under fair conditions, and can be fed without any further preparation or cost in labor. It is not so with peas or barley, and, again, oaten straw is of all straw the best to keep as a stand-by in times of scarcity for cattle feed. In some seasons good feed oats are sold for export as low as 1s. 3d. per bushel.

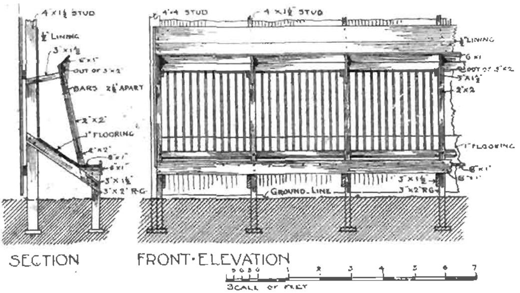
For yield of fodder per acre, nothing equals a well-established lucerne patch under irrigation, with its four and five cuttings through the summer. No grain crops give more feed value per acre than oats with its grain and straw. As a rule, the seed does not need pickling, and will lie in the ground awaiting rain with less risk than any other suitable grain.

Lucerne hay can be cheaply made and cheaply fed, and oats need no further preparation than the threshing. Carting the hay out to sheep in the paddocks will be found too wasteful. When done in the summer, as it will be, for store lambs can then be bought to best advantage, the leaves break off and get trampled in the dust, and what is not lost altogether is made less nutritive owing to the sheep eating the dust along with it. Windy days will also waste a lot; and so will wet and showery weather.

We have no need in Australia to house sheep, but in hand-feeding it is necessary to have contrivances that will protect the feed from rain and wind and that will prevent waste through stock trampling it under foot.

Feeding racks should be placed in suitable sized grass paddocks, and the sheep should be allowed to graze when they like and have free access to an abundant supply of good water. These conditions are just as important as the feeding with hay and oats, for the latter are dry and heating foods.

Hay should form the principal food for the sheep to come and go to. They will clean up the oats first. If lambs are being fattened, a pound to every ten lambs, with the morning hay, is fair feeding. Nothing is gained by over-feeding on oats, but they should have all the hay they will eat. They will, however, prefer picking about the paddock between times. The racks should be filled at least twice a day when feeding fair numbers.



FEEDING RACK AND GRAIN TROUGH.

We are indebted to our Tasmanian sheep men for evolving the rack and grain trough shown in the accompanying plan. These work admirably, and the only objection with us is that the adoption demands an outlay of capital which only those on suitable freehold farms can undertake. They should be substantially and carefully built, and their situation carefully planned beforehand. It will be noticed that the rack leans the opposite way to the rack usually used for horses, standing out in the bottom and leaning towards the wall at the top. It is set 16 inches from the wall at the bottom, and 8 inches at the top, along which a 6-inch board is placed slanting upwards, in order to form a slanting shelf to guide the hay into the rack when being filled. The sheep, in picking out the hay from between the bars, will break some leaves off, which will fall into the oat trough and not get under their feet. The sheep eat from the lower part of the rack, for the oat trough, together with the rack, being sloped back, keeps them from reaching higher. It also keeps the bullies from getting close in, side on, and keeping others off. The sheep will leave a certain amount of broken stems in the racks, which, when gathered, can be fed to cattle as it is not damaged as it would be if the hay were given to the sheep on the open ground. In places sheltered from the wind, a double rack can be made under the one cover, back to back, but in windy situations, a back to the shed is necessary.

The rack illustrated should be 2 feet 6 inches wide or 3 feet over all, the distance between the bars 2½ inches full. This does for sheep or lambs, as it is not advisable that they should pull out much at once. The grain

trough is 6 inches wide and 2 inches deep. Two 9-inch boards are placed in the back of the rack and sloped so that the loose leaves keep coming to the feed trough. The grain trough is 12 inches from the ground.

A covering in the form of a skillion is necessary, with the eave projecting far enough out to allow rain water to drip free of the sheep when feeding. A sheep to every 12 inches is the average allowed.

The demand of late years for rams of the British breeds points to larger numbers of suitable sheep for export fattening being soon available. There will always be a large class of graziers on cold winter country who cannot produce any other than a store lamb. Although this is country suitable for rape and turnip growing in connexion with fallow and fertilizers, for a great number of years yet there will be graziers with holdings too large to do much with these crops on a large scale.

As a wool-growing community principally, graziers have not had occasion to give much consideration to encouraging the quick thriving abilities in sheep that are now gradually coming into request. With hand-feeding it will not pay to feed slow doers. There are breeds of sheep that direct the principal part of the food eaten into wool; these are not desirable for a hand-feeder of export sheep, and again, to make hand-feeding most successful, paddocks are necessary to bring on backward stores to forward condition cheaply. There is not at present sufficient in the business to allow of very poor sheep being hand-fed into fats, unless, of course, they can be purchased at low rates, which will not always be possible.

GARDEN NOTES.

J. Cronin, Principal, School of Horticulture, Burnley.

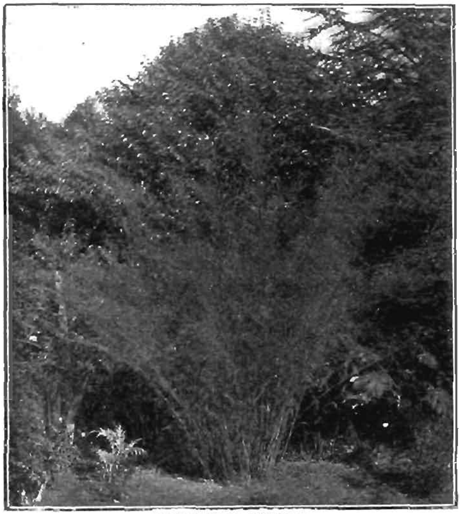
The Bamboo.

Plants generally known as bamboos embrace several genera, including *Bambusa*, *Arundinaria* and *Phyllostachys*. With few exceptions they are natives of India, Japan, China, and other parts of Eastern Asia; but a few occur in tropical America, and the well known bamboo of most Victorian gardens, the Danubian reed, *Arundo donax*, is a native of South Europe. The latter has been planted in almost all districts and divisions of the State, and although a moisture and shade-loving plant—as are all others of this class—the Arundo is often seen growing in large clumps or patches under conditions totally different to those generally considered necessary for its well-being. When well established it will endure fairly rough conditions, and is a valuable shelter plant for poultry, in addition to its picturesqueness; the reeds or canes are also valuable as stakes or for trellis making. This fairly common plant is worthy of much extended culture, especially where moist and shady positions are abundant.

The finer types of bamboos are not so easily grown as the Arundo, but where suitable conditions prevail they are fairly hardy and require little attention when well established. Shelter from hot winds is the most important factor in selecting sites for them, and sufficient water available to insure moderate moisture in the soil during hot dry periods is of almost equal importance. In many of the public gardens in Melbourne and suburbs several kinds are found to thrive with a little care and attention when first planted, the effect produced quite justifying the trouble taken to establish them. Some kinds are erect in habit of growth and attain a height of 15 to 20 feet, others are smaller, but far more graceful in appearance, while some are distinctly dwarf plants and suitable for planting in the smallest gardens.

SOIL—SITUATION—CULTURE.

The most suitable soil is a light loam that contains a fair amount of humus. Heavy soils may be brought to the right condition by the addition of manure containing plenty of straw or other material tending to produce porosity, while sandy soils will benefit by the addition of strong loam or clay, or cow manure. Though bamboos are naturally denizens of low and shaded situations, they will not thrive if the soil is water-logged and sour. A fairly drained soil is found in gardening practice to be an absolute necessity for their successful cultivation.



ARUNDINARIA FALCATA.
SYN. BAMBUSA GRACILIS.

A suitable situation is of greater importance than soil. Bamboos must have protection from fierce winds to do well. A situation sheltered from north winds in summer is most suitable. In the Melbourne Botanic Gardens they are grown in all aspects, a feat that is easily accomplished there on account of the shelter provided by the splendidly designed groups of large trees that have been planted to provide such shelter for tender plants in addition to scenic effect. In small gardens the shelter of a fence, hedge or tree, or house, will supply the conditions suitable. Bamboos are often planted in mixed groups of plants and in such situations are fairly effective, but to display them to advantage, they should be grown if possible in rather isolated positions where there is room to develop their growth and elegant characteristics without hindrance. Many kinds are specially suitable for planting as specimens on lawns, *Bambusa gracilis* being one of the best for the purpose.

Bamboos are propagated from divisions of the plants and cuttings of the rhizomes, *i.e.*, creeping root-like stems growing beneath the surface. Cuttings of the canes or small branchlet-like shoots will also produce plants. Early spring is the best time to divide bamboos where the summer conditions are very dry and hot; the divisions root readily in fairly warm soil and become in a measure established before the weather is severe. Late spring in cooler districts will supply approximate conditions. The plants should be fairly supplied with moisture during dry weather and will benefit by the application of a mulch where water is scarce. The treatment necessary for the cultivation of the *Arundo donax* is practically identical, except that less care is necessary generally as the plants are hardy and will grow in soils and situations unsuitable for the more delicate bamboos. The whole of the class are suitable for planting beside water-courses, &c., if the aspect is at all sheltered from hot winds.

A number of kinds is procurable from the various nurseries in the State. The original name, Bambusa, has been retained by nurserymen in most cases, although the latest classification refers most of the kinds to different genera. A few of the best of the kinds available are:—Nigra (black-stemmed bamboo) grown to a height of 10 or 15 feet; Metake, also known as Japonica, a vigorous kind of moderate growth; Gracilis (*Arundinaria falcata*) a beautiful drooping kind that grows to a height of about 10 feet; Simonii, a tall erect grower; and Fortunei, variegated, a dwarf and neat form.

Flower Garden.

Manuring and digging beds and borders, preparing ground for the reception of subjects that require special treatment, planting, and pruning, are seasonable operations. Horse manure in a half-rotted condition is probably the best general manure for plants usually grown for production of flowers or foliage effect, always excepting such plants as heaths, boronias, and others, to which manure in any form is destructive. The manure should be evenly spread and well mixed through the staple, at some little distance from the stems of the plants, thus avoiding in a great measure the cutting of the important roots of the plants.

Planting of roses should be done without delay. The soil should be well and deeply worked and manured, but no manure should be allowed to come into contact with the roots. Bruised and damaged roots should be cut back to a sound portion and the remaining roots so disposed and regulated that they will be likely to push their resultant extensions into the soil in all directions. Such root extension progresses rapidly when the soil is warmed in spring and supplies abundant plant food material for the development of the plant if the soil is sweet and in good condition; but it may be safely asserted that the presence of manure in quantity at the roots when planted has an opposite effect, and that such a condition is responsible for the failure of more roses and other plants than an absolute absence of manure of any kind could possibly produce.

Pruning deciduous plants of many kinds is an operation often neglected, with the result that the specimens become so crowded with small and ill-placed shoots that the flowering is poor and unsatisfactory. Weigelias, lilacs, spireas, and many other deciduous shrubs will benefit by being thinned during winter. The flowers may be slightly less in quantity but of much finer quality and the growth of the plants generally more satisfactory. Thinning and spacing the shoots of roses and other plants is undoubtedly one of the most important features in their cultivation. If the plants become

crowded and the tops are merely cut off, additional growths develop on account of such cutting and further crowd the head; while, if the shoots are spaced and a number removed entirely, the tendency to development of growth is from the base of the plant and along the main shoots. The finest flowers of many kinds of roses are produced from such shoots, and the plants are invariably healthier. Newly planted roses should be pruned well back. In many places old plants of roses are infested with white scale, and the most suitable time to attack this pest is after the plants have been pruned. A thorough spraying with kerosene emulsion at a strength of 1 part kerosene to 10 parts water is effective against the scale and any aphides that may be present. Beds for growing chrysanthemums next season should be deeply dug now and the surface allowed to remain in a rough exposed condition for a few weeks. Manure may be added if the soil is new and poor, or may be prepared for application some little time before the season of planting arrives.

ARUNDINARIA JAPONICA.
SYN. BAMBUSA METAKE.

A number of bulbous plants, including lilies, gladioli, tigridias, and tuberoses, may be planted at this season. As previously frequently mentioned, no manure should be allowed near the bulbs, and in most cases it is altogether unnecessary.

Kitchen Garden.

Ground should be prepared for onions, potatoes, peas, beans, &c., that will require to be sown or planted during the next few weeks. Where the soil has been liberally manured with stable dung for some time a light dressing of lime or gypsum will be found beneficial. Certain manurial properties contained in soils and manures are not available for the use of plants unless lime in some form is present.

Successional sowings of peas, beans, and various saladings, may be made.

FOURTH PROGRESS REPORT ON VITICULTURE IN EUROPE.

(*Continued from page 363.*)

F. de Castella, Government Viticulturist.

Reconstitution in Spain (*continued*).

The Malaga District.

From Jerez I proceeded by rail to Malaga, where I arrived on the 30th November. Malaga is famed for its wine, which has long been well and favorably known, but even more so for its raisins. The word "Malaga" has become synonymous with all that is best in the way of dessert raisins. It is from Malaga that we imported the Gordo Blanco Muscatel vine which yields the raw material for our own rising raisin industry. Malaga itself is a prosperous seaport town of some 125,000 inhabitants situated at the mouth of the Guadalmedina and near the point where the Guadalhorce empties itself into the Mediterranean. On either side of the latter river stretch wide fertile river flats which constitute what is known as the Vega (plain) de Malaga.

This fertile plain is devoted to general agriculture, chiefly sugar producing plants, among which beet root occupies first place, but in the mild climate of this part of Spain even the sugar cane can be, and is cultivated on a fairly large scale. It is in the Vega and on its borders, that the raisin vineyards are situated, wine being made on the poor stony hillsides. Viticulture is thus divided into two main branches, but in some of the neighbouring villages a third form is to be met with, as large quantities of fresh grapes are shipped from them packed in granulated cork. Raisin production is now-a-days the chief viticultural industry of Malaga, it having overtaken winegrowing, which never recovered from the blow it received when the vineyards fell a prey to phylloxera.

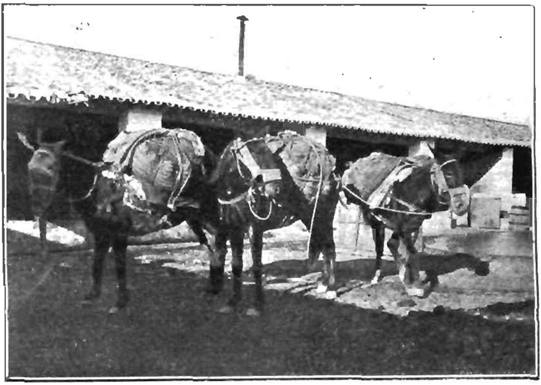
In its relation to the insect this district presents some interesting features. It is one of the districts of Spain where phylloxera was first discovered. It was first found in the vineyard of La Indiana in the parish of Moclinejo, near the centre of the wine producing region, in the year 1878. Its soils are very varied, several quite distinct types being met with at short distances from one another. The wine producing region was the scene of disastrous failure in the way of reconstitution, a failure which should serve as an object lesson, showing as it does the danger of attempting to use resistant stocks without due attention to considerations of adaptation and affinity and without suitable preliminary preparation of the soil.

Before proceeding to describe reconstitution it will be well to examine a few leading features in connexion with the viticulture of the district, such as varieties cultivated, climate, soil cultural methods, &c.

Varieties.

For raisin drying the grape most extensively grown is certainly the muscatel, which we know so well under the name of Gordo Blanco. The season was too advanced at the time of my visit for it to be possible to decide the vexed question as to the identity or otherwise of this variety with the Muscat of Alexandria. Many authorities consider the two to be

identical. Some, however, consider that there is a slight difference between them. Another vine named the Almuñécar is grown in some parts of the district. Although not a Muscat it produces fine raisins of large size. It is not grown on a large scale, and the Muscatel is practically the only raisin grape grown. Currants and sultanas are unknown. According to the official statistics for 1906, the province of Malaga possessed 57,525 acres under vines, which produced 31,460 tons of grapes, of which 10 per cent. only were made into wine. Allowing an equal quantity sold in the fresh state, we have 24,000 tons of drying grapes, which would yield 8,000 tons of raisins; 1906 was a very bad season, and in an ordinary year the production would be considerably higher. Malaga raisins are almost exclusively undipped, dessert raisins. In seasons when there is over production a few dipped or pudding raisins are made, but this is exceptional. Details as to drying and packing must be held over for the present, as also those concerning wine making.



PACK MULES LADEN WITH GRAPES.

Although the production of wine does not amount to anything like what it was before phylloxera, the Malaga wine industry is remarkable for the number of distinct types turned out. These vary from a rather full bodied dry white to an exceedingly sweet fortified wine. Brown Malagas, which owe their color to the addition of highly concentrated boiled grape juice known as *arrope*, are chiefly shipped to France. These wines are sometimes as dark as porter or stout and distinctly bitter. They constitute a type of wine little known in Australia, which in olden times was very largely made in Andalucia.

In Malaga scarcely any but white grapes are grown for wine. Such sorts as Lairén, Listan or Palomino and Jaeén Doradillo are occasionally met with, but the Pedro Jiménez is far more extensively grown. It is the principal Malaga wine grape. I was much struck by the difference between the true Pedro of Malaga and Jerez and the vine we know under the name

of Pedro in Victoria. The latter is evidently wrongly named, as it is quite distinct from the true Pedro Jiménez. Malaga muscat is made from the Gordo Blanco, which is allowed to become very over-ripe. The fact that this grape is usually held to make an inferior wine with us is no doubt due to insufficient maturity at the time of crushing. The conveyance of over-ripe grapes to the crushing house on pack mules is shown in the photograph which is reproduced.

CLIMATE.

The climate of Malaga is one of the mildest in Spain. Situated as it is almost at the extreme south of the Peninsular this was only to be expected. It is in addition sheltered from the north by high mountains, which renders it milder than Jerez or Seville for example. The culture of sugar cane has already been referred to. It is true that this crop is frequently cut down by frost in winter, but so profitable is it, owing to the high protective tariff of Spain, that three crops in five years are considered sufficient to pay expenses. This is what one can rely on as a rule. Sugar cane culture is not a recent innovation, for it has existed in the district since the time of the Moors. It is about the northern limit for the plant, however, as it fails to ripen its seed. Further evidence of the mildness of the climate is afforded by the number of fine custard apple trees or *Chirimoyas*, as they are called in Spanish, which are to be seen about. These ripen their fruit thoroughly, and are seldom damaged by frost. To come to figures, the average annual temperature is 66 degrees Fahrenheit, and the annual rainfall varies from 20 to 28 inches. Most of the rain falls between October and January.

A noteworthy feature of the Malaga climate is the moisture of the air, owing to proximity to the sea and its being situated in a valley between high hills. This has no doubt much to do with the thinness of the skin of the berry; one of the chief factors which contribute to make the Malaga raisin the finest dessert raisin in the world.

SOILS.

Four distinct types of soil are to be met with in the district:

1. Slaty or schistose soils of primary geological age.
2. Tertiary soils rich in lime.
3. Typical alluvial soils.
4. Stiff clays.

The soils of the first type have, since the earliest times, been devoted exclusively to the cultivation of wine varieties, the berries on the dry hill-sides being too small for raisin drying. The *Montes de Malaga*, which produced the celebrated mountain wine in old days, are composed of slates or *pizarras* of primary age (Silurian). The rock is much fissured and broken, and the soil covering it is very dry and shallow. Although free from lime in excess, owing to neglect of subsoiling and use of unsuitable stocks for so dry a situation, reconstitution here proved a signal failure, and the majority of the once prosperous "Mountain" vineyards have now disappeared. Discouraged by the first failure due to want of knowledge of the requirements of the American vine, growers lost heart and feared to face the task of reconstitution a second time, though with the more complete knowledge since acquired it could now be brought to a successful issue.

The Tertiary soils of Malaga have only proved troublesome on account of the large proportion of lime they contain. The use of stocks capable

of supporting it has enabled successful reconstitution to be effected. These limey soils usually constitute the low hills and almost level land bordering the Vega. At Samara and Paradones, two vineyards I visited near the village of Churiana, the soils contained 35 per cent. and 50 per cent. of carbonate of lime respectively. In this neighbourhood the formation is chiefly Pliocene sandstone, but geological formations are much mixed up. A little higher up the hillsides one gets into primitive rocks free from lime, whilst on the opposite side of the Vega one sees dry hillsides of secondary age (Jurassic), which formerly produced wine, but which have not been replanted, land-owners fearing a similar failure to that experienced in the Montes de Malaga.

It is in the flats of the Vega that the third and fourth types are to be found. They are much mixed up, the Vega, from a soil point of view, being very patchy, as might be expected in sedimentary soils, recently deposited in a wide valley, in close proximity to high and rugged mountains made up of very varied geological formations.

The looser portions consist of rich, free, but not as a rule sandy soils, usually of a dark grey or black color. They contain under 5 per cent. of lime and in them, as might be expected, American vines thrive. So far as adaptation is concerned no trouble has been experienced. These are typical "easy" soils. Some of these alluvial soils are very pebbly and largely made up of coarse gravel washed down from the ranges. Some of them remind one strongly of the "Alpine Diluvium," so much in evidence near Montpellier (France).

The clay soils have given more trouble. The worst of these, known locally as "*terrenos arcillosos grises*" (grey clayey soils) are not unlike the blue clays to be found in certain parts of Northern Victoria. They contain, however, more lime, though the proportion of this element, usually under 5 per cent., is not enough to injuriously affect even sensitive American stocks. The color of the soil seems to have a direct bearing on the physical nature, as these grey or blue clays are stiffer and more unsatisfactory than those of a yellow or reddish color.

Soils intermediate in character between the two last described are of frequent occurrence in the Vega.

ESTABLISHMENT OF THE VINEYARD, TRAINING, PRUNING, CULTIVATION, &C.

The failure of reconstitution in the Montes de Malaga was in a large measure due to neglect of deep preliminary cultivation. This was not the rule in former times the subsoil of fissured rock being sufficiently penetrable to deep rooting vinifera varieties, which were planted on untrenched ground. Though the yield was not heavy, the cost of establishing the vineyard was small and the wine produced of excellent quality and considerable value.

When American stocks were planted in this way disastrous results were inevitable. Large areas were replanted, mainly with unsuitable stocks for so dry a situation. Unlike Portuguese growers, who were quick to recognise the different requirements of viticulture under altered circumstances and modified their methods accordingly, the Malaga wine growers finding reconstitution to be a failure, resigned themselves to their fate and with few exceptions the Montes de Malaga are not now under vines. From the raisin vineyards of the Vega one can still see the white houses dotting the hillsides. These are almost all that now remains of these once prosperous wine vineyards. Other causes no doubt aggravated the plight of these

land owners. Merchants finding their supply of this kind of wine cut off by the destruction of the vineyards secured their supplies of similar wines elsewhere. The change of fashion which is so much complained of in Jerez also affected Malaga, and what wine was yielded by the first re-planted vineyards met with a poor demand at unremunerative prices.

It is true that subsoiling was tried in some cases, but on these steep hillsides it often led to the washing away of the soil by the very heavy rain sometimes experienced in this part of Spain, for terracing was not practised in Malaga as it used to be from time immemorable on the Douro. A few small growers have of late years replanted small areas in a more thorough manner and are, it is said, obtaining fair results, but the whole-sale ruin of this once prosperous region is very striking and should serve as a warning of the danger of underestimating the value of subsoiling for American vines.

The distance apart of the wine vineyards is about 6 x 6 feet. The vines are usually pruned short. Sometimes a short rod is left but the pruning is much shorter than in most other parts of Spain, such as Jerez. On these dry hill sides this short pruning was inevitable. The vineyards are exclusively cultivated by hand with the hoe.

Taken as a whole the Malaga wine industry is in a most depressed state. The *Raisin* vineyards are in a far more satisfactory condition. They are mostly situated in the Vega or on the low hills bordering it. Campanilla, a small town or large village ten miles from Malaga, may be looked upon as the centre of the raisin growing region. The vineyards are always situated on almost level ground, hillsides not yielding fruit of sufficient size.

Irrigation is frequently applied though it is not by any means the general rule. It must be remembered, however, that Malaga has a fair rainfall, and that both culture, pruning, and training are such as to insure the best use being made of what rain does fall and to protect the fruit in the greatest measure possible. Irrigation is held in some quarters to have an injurious influence on the quality of the fruit though it increases the yield. In the irrigated vineyards water is often only applied in the winter time. The extent to which winter irrigation is practised in Southern Spain impressed me very much. It is a common thing to see vines and olives being irrigated in December (June in Australia), partly no doubt because in many situations this is the only time when water is available, but with the subsoil well watered and careful cultivation during the early summer to assist its retention, it is wonderful what fine yields can be obtained.

Millions of gallons run to waste each winter in Victoria and in many localities much could no doubt be done in the way of utilising this surplus water for winter irrigation. The physical nature of many of our soils is, I understand, less suitable for such treatment than that of Andalucia, but there are, I feel sure, many localities in which the system is worthy of adoption.

A curious feature about raisin vines and one in which they differ greatly from those grown for wine is that heavy manuring instead of interfering with the quality of the product seems to improve it. The fashion now-a-days is for a dark raisin—what is termed blue-black in the trade. It has been found that this deep color is encouraged by heavy manuring of the vines.

Reconstitution has been carried out on a large scale in the raisin growing vineyards, and though trouble has arisen in connexion with several

points it has on the whole proved a success—infinitely more so than in the neighboring wine region of the Montes de Malaga. Want of Government assistance in the way of experimental work in the early days of reconstitution is responsible for mistakes which have been made in the more difficult soils. Growers were left a good deal to their own resources, more so than in several other parts of Spain.

In the raisin vineyards subsoiling is now the invariable rule, it being considered useless to plant American vines on insufficiently prepared land. The vines are planted fairly close for such a warm climate, the usual distance being 3 ft. 3 in. x 6 ft. 6 in.

In the earlier days of reconstitution growers were taught that American vines required to be planted further apart than the old ungrafted ones and 4 feet x 10 feet was tried. The old distance of 3 ft. 3 in. x 6 ft. 6 in. has, however, been generally reverted to. Sometimes the plantation is made on the quincunx or septuple system with the vines 4 ft. 6 in. apart.

So far as plantation and grafting are concerned, what I have already reported on the Jerez district applies also to Malaga. Vineyard grafting is the rule and bench grafting the exception. The yema graft is sometimes used, but the espiga is more usual. The yema is said to only give good results on fairly young stocks—if over three years old the result is unsatisfactory. The majority of small growers propagate their own "*barbados*" or rooted Americans, in nurseries. Autumn planting is very popular; at the time of my visit in early December, American wood was selling freely for propagating purposes, small growers buying American cuttings for immediate plantation in nurseries.

Cultivation is carefully performed, though the number of operations is less than in Jerez. Ploughs are beginning to be used in some vineyards, but the bulk of the work is carried out by hand with the hoe. The first or chief winter cultivation is executed in December. It is known as "*primera cava.*" It is very deep, the soil being worked to a depth of over a foot. The ground is worked into basins for the retention of rain water as at Jerez, but the term "pileta" is not employed here. The second working is known as "*vina,*" it is executed in early spring and leaves the ground fairly level. "*Arropar*" is the name used to describe the third and last cultivation of the season which consists of the earthing up of the stem of the vine so that the lower bunches practically rest on a small heap of earth around each vine. The appearance of the low vines each of which grows out of the summit of a small heap of earth is characteristic.

The pruning of the Malaga raisin vines is one of the most remarkable features of the district. It is exceedingly short, and reminds one strongly of the very short pruning of the Gâtinais district of France, so thoroughly described by Dr. Guyot. The Malaga system has been described at length in *Guide to Growers*, No. 26, by Mr. C. Bogue Luffmann, issued by the Department of Agriculture. This publication is now out of print, but vignerons who happen to possess a copy are advised to re-read it. The accompanying figure shows a typical Malaga raisin vine before and after pruning. The crown is not unlike a large mushroom; it is supported by a short thick stem. The short spurs always point downwards, sometimes even more so than in the sketch which represents a fair average vine of some fifteen years old. Seven to nine

spurs are left on each vine; they are cut back to one clear eye and the blind eye at the base. This exceedingly short pruning, by reducing to a minimum the elongation of the arms of the vine, causes the crown to assume most curious shapes. Most vines have no arms at all. The object of this style of pruning seems to be to keep the fruit in close proximity to the ground while ripening, and to insure its being protected from the direct rays of the sun by a good covering of leaves. The vines are neither staked nor trellised nor are they tied up in any way during the summer. Disbudding is carefully attended to. With such very short pruning the tendency of the vine to throw out many suckers and water shoots is increased and these must be removed. In early summer all shoots bearing fruit are stopped back at the eighth or tenth bud. This promotes setting and causes the berries to fill well.

RAISIN VINE BEFORE AND AFTER PRUNING.

Such a style of pruning and training is more calculated to promote quality than quantity, but Malaga dessert raisins are a luxury rather than an ordinary food product, and a slight increase in quality means a much more than proportionate increase in price. Nevertheless good crops are frequently obtained. Don Leopoldo de Salas y Amat mentions yields of up to nearly two tons of raisins per acre. Though the quantity of fruit on each vine is limited there are more vines per acre than we are accustomed to in Australia. With vines at 3 ft. 3 in. x 6 ft. 6 in. one has 2,500 vines per acre.

The raisin industry of Malaga is a special one and very different from our own. Whether the highest grade dessert raisin can be produced in the dry atmosphere of our inland climate, is a question which it is hard to answer. Even admitting that it can, there is not nearly the same local demand for the dessert as for the dipped or pudding raisin. The suitability of the climate and soil of Australia for the production of a high grade pudding raisin has been thoroughly proved.

REVIEW OF THE DAIRYING SEASON 1907-8.*

R. Crowe, Superintendent of Exports.

The Export Season now closing has been remarkable in many ways. Its most gratifying feature was the record prices butter reached in London; but its other striking aspects—a marked falling off in production, a reduction in condition of the majority of our dairy cows, and the throwing out for use next season and the loss of many of them—are not so pleasing. At the moment, butter is being imported at the rate of between 4,000 to 5,000 boxes a week from the neighbouring States to help local requirements, and, were it not for New South Wales and Queensland, the price of butter to Melbourne householders would probably now be 2s. 6d. per lb. The present loss is perhaps the least important factor, for when feed becomes plentiful supplies will no doubt be immediately forthcoming. The breaking of business connexions with export markets for the period of months which these disasters have entailed is almost irreparable. The good feed on the north coast of New South Wales caused thousands of dairy cattle to be sent there by rail and sea during the last couple of months. Although it may appear somewhat cruel to blame dairymen for what to most of them may seem to have been beyond control, still it was patent that should a long dry spell be encountered the results would be just what they have been.

A rare opportunity was missed on Boxing Day last when there was a general fall of about three inches of rain. Anyone who had the good fortune to plough and put in a crop of maize or sorghum and cultivate it properly fared well, but unfortunately, most farmers were just then busily engaged in gathering their harvest. It was risky in the extreme to rely on a plentiful downpour at that period. To avert calamity some kind of crop should be grown in season to be made into hay or ensilage.

IRRIGATION.

The imperative necessity of conserving and using water for irrigation has again been brought prominently to the front. It must be a matter of great consolation to those located in the northern areas that the Minister of Agriculture and Water Supply is so much alive to their interests. When his scheme is completed it is likely that if another drought is experienced, production owing to the increased amount of fodder available rather than being diminished to so great an extent as has been the case in the past, will be greater. For instance, lucerne, the king of fodders, revels in heat, provided plenty of water is suitably applied.

In a fairly moist average season many would be careless in using water, but with prolonged dry weather, everyone would make the most of it. Instances exist in certain favored districts of the north where dairymen secured averages of upwards of £10 per cow.

BUTTER EXPORTED.

QUANTITY.—From 1st July, 1907, to date 14,567 tons of butter have been exported from Victoria to other destinations as compared with 21,562 tons for the whole of the preceding season, comprising 10,727 tons to Great Britain, of which 28 per cent. was unsalted as compared with 30 per cent.

* Paper read at the Fifteenth Annual Conference of the Australasian Butter and Cheese Factories Managers' Association, held May 1908, at Melbourne.

for the previous season: 983¾ tons to South Africa, 592 tons to Eastern countries and 2,264 tons to Interstate Ports.

The following table shows the quantities of export butter produced in the various districts during 1907-8, and the average points scored:—

	Boxes.	Average Points.
Western District Co-operative Factories	112,013	95.54
Western District Private Factories	17,396	90.63
North and North-Eastern Co-operative Factories ...	88,484	92.16
North and North-Eastern Private Factories ...	16,093	90.13
Gippsland Co-operative Factories	125,282	92.94
Gippsland Private Factories	10,985	92.37
City Companies and Firms Manufacturing and Exporting Butter	97,898	91.03
Agents, Buyers and Exporters (not being Manufacturers)	20,512	92.13
Average points of all Butters graded for Export 1907-8	483,663	92.01

The Glenormiston Factory secured the highest average points for the season with 97.83 for 10,342 boxes, Terang next with 97.7 points for 758 boxes, and Grasmere third with 97.53 points for 6,255 boxes.

QUALITY.—The quality of the butter for the closing season has not been up to the usual standard because of the long spell of very hot weather, whilst the season preceding was remarkable for the favorable weather conditions up till about Christmas. It is still a matter for regret that many factories are inefficiently equipped as regards refrigeration. Heat is very far reaching in its effects on the quality of dairy produce. The cream cannot be delivered in as good condition, and even though sufficient refrigation may be available in the factory its quality cannot be wholly redeemed.

Another direction in which hot weather acts deterimentally on the produce is during its transit from the factory to the railway station, much of it in January and February last having arrived at the Freezing Works in a heated condition. I regret to have to state that in some instances, even where refrigerating power was abundant, the butter did not reach us in as good condition as it might have done. There are managers who evidently regard their responsibility as ended when the butter is delivered in good condition to the carrier at their factory door. They should follow their produce right into the insulated truck at least, and so arrange that it shall not be too long either on the road or at the railway station awaiting the ice truck.

It has not been uncommon on opening a truck containing the output from two different factories in one district, both similarly situated as regards distance from the railway station to find one brand in firm and satisfactory condition and the other almost liquid and running out of the boxes. If each parcel were traced back to the place of manufacture the conditions between here and the local railway station would be found to be equal, but from that point to the factory the treatment of the respective parcels would be widely divergent. The one manager would be found to have set his butter well by keeping it in the freezing chamber at least twenty-four hours before despatch, and would on no account have sent out the current day's make to be damaged and would have taken every care on the road by covering it with wet blankets or otherwise protecting it to secure it against the weather; and immediately on its reaching the station would have it put into the iced car; or, if the quantity forwarded did not warrant the Railway Department leaving an iced car at that particular

station, then its arrival would have been timed to meet the train without having too long to wait. On the other hand, the more careless man would be found to have neglected one or all of these precautions, the surrounding dairymen being the losers. Although well aware of the difficulty of handling butter in the country in bad weather I am thoroughly convinced that these obstacles can be overcome and the loss reduced to a minimum. I have on a previous occasion referred to the fact that two factories, the Corryong and Eskdale, situated further away from the railway station and in comparatively warm districts deliver their butter to the cool stores in a very creditable condition. Corryong is over 40 miles from the nearest railway station whilst the Eskdale factory has to cart its butter over 30 miles by road and then in each instance it has to travel 210 miles by rail.

PRICES.—The prices realized have been the highest ever secured in the history of our export trade. In February record prices were current in London; at that time of year under ordinary circumstances prices are comparatively low and every one was astonished to find the market soaring up and up till it reached 154s. per cwt. The average for the season secured by our best factories will not figure out at much less than 120s. per cwt.

At your last Conference the best average price that I was able to announce for the previous season was 104s. 9d., whilst the all-round average was fixed at 100s. Many reasons have been forthcoming regarding the cause of these phenomenal prices. The greatest factor no doubt has been due to shortage of supply and the new legislation controlling the trade in England has been generally credited with a considerable share.

For the first time milk-blended butter and mixtures of butter and margarine have had to face the market under their true colors. No doubt margarine is a good wholesome food; and there is no reason why a person should not eat a compound such as milk-blended butter containing over 20 per cent. moisture provided they are so labelled. In previous years from all accounts these commodities were extensively sold under the representation that they were pure butter.

BUTTER OR CHEESE.—During the season 400 tons of cheese were shipped to all destinations, 34 tons being consigned to Great Britain as compared with 46 tons the season before. It is satisfactory to know that the quality was reported upon favorably and the prices compared well with those realized by New Zealand and Canadian cheese.

The cable reports appearing in the papers of 6th inst., read :—

> Experts well satisfied and consider best Victorian is about equal to average Canadian.

The value of the best cheese was stated at about 60s., and other lots tapering down to 6s. less.

Comparing the current season's prices it will be found that both products are harmonizing once more. Till three years ago, the prices ruling for butter and cheese were favorable to the export of butter from this country; then, owing to the phenomenal demand for cheese, prices for it were much more remunerative in recent years than those for butter, which had the effect of diverting more of Canadian and New Zealand milk into cheese than formerly.

The following is an extract from *The Pastoralists' Review*:—

> "Wellington, 1/5/08 :—The exports of dairy produce from New Zealand for the statistical year ended 31st March were approximately :—Butter 13,000 tons, cheese 15,000 tons. For the previous year the quantities were, butter 15,000 tons, cheese 9,000 tons."

From these figures it will be seen that, whilst the exports of butter fell over 16 per cent., the cheese exports increased by 66 per cent. In a small measure this no doubt also had an influence in creating the shortage of butter experienced on the London Market.

There is a good field for cheese-making in Victoria. Prices locally have been highly remunerative and it is somewhat surprising that it does not receive more attention, especially from butter factories possessing dual plants.

The following table prepared some time ago by Mr. Archer, one of the Department's Dairy Experts, indicates the relative values of butter and cheese after deducting freight and all other charges for each:—

Cheese. per cwt.			Butter. per cwt.		Cheese. per cwt.			Butter. per cwt.	
s.	d.		s.	d.	s.	d.		s.	d.
35	0	...	66	2½	53	0	...	100	0
36	0	...	67	11	54	0	...	101	10½
37	0	...	69	9¾	55	0	...	103	9¼
38	0	...	71	8¼	56	0	...	105	7¾
39	0	...	73	7	57	0	...	107	6½
40	0	...	75	5½	58	0	...	109	5
41	0	...	77	4¼	59	0	...	111	3¾
42	0	...	79	2¾	60	0	...	113	2½
43	0	...	81	1½	61	0	...	115	1
44	0	...	83	0	62	0	...	116	11½
45	0	...	84	10¾	63	0	...	118	10½
46	0	...	86	9½	64	0	...	120	9
47	0	...	88	8	65	0	...	122	7½
48	0	...	90	6¾	66	0	...	124	6¼
49	0	...	92	5½	67	0	...	126	4¾
50	0	...	94	4	68	0	...	128	3½
51	0	...	96	2½	69	0	...	130	2¼
52	0	...	98	1¼	70	0	...	132	0¾

It will be seen that on the London market 120s. 9d. for butter is equal to 64s. for cheese, whilst 60s. for cheese is equivalent to 113s. 2½d. for butter, 54s. for cheese being equal to under 102s. for butter.

BUTTER DEFECTS.

MOTTLE.—*It is indeed painful for me to have to refer to this common* defect in butter. There are indications that it is on the increase—at any rate, it was noted and reported on to makers more frequently last season than ever before, and yet it is most easily controlled.

It is difficult to account for the negligence displayed by some butter-makers and the lack of interest taken by certain managers. The presence of this defect is indubitable evidence of downright carelessness. If I were a manager and had occasion to caution the butter-maker on account of mottle being reported per the grade certificate he would get his walking ticket the second time it occurred. It seems like going back to the A.B.C. of the business to mention in the year 1908 that this fault is invariably the result of insufficient working-in of the salt. A clock in the butter-room would be the best check and there is no reason why a solitary box of mottled butter should be made in Victoria. I suspect that the reason of the increase is the gradual dropping of the second working—I daresay there is not a factory now working their butter the second time, with a view to retaining as much weight as possible providing the limit of 16 per cent. is not overstepped.

Cloudy Moisture.—Doubtless the same cause is responsible for the increasing prevalence of cloudy moisture in butter. Perhaps the present school of makers—new butter-makers are coming into the field every day—feel that to fully work soft butter tends to injure its texture. I remember early in my experience having disproved such a natural fallacy. In many instances mottle and cloudy moisture are to be found together obviously substantiating my assumption that weight greed is at the bottom of the trouble.

Free Moisture.—A rather common defect reported by graders is the appearance of free moisture, and, in a good many butters, this loss is related to the defects already touched upon, namely, want of refrigerating power, and sometimes a desire not to throw chances away under the heading of weight. It is also due to lack of skill in manufacture; however, were the last-mentioned the only cause I incline to the opinion that there would now be merely a fractional part of the butter so affected. Whilst not professing to know much about the impounding or hiding of moisture in butter, I would urge the necessity after rinsing of permitting the butter to drain well in the churn, and not overloading the worker so as to leave a stop at the end of each channel made by the rollers preventing the escape of the moisture squeezed out in the process of working.

Color Variation.—Sometimes a box is found to contain butter of two distinct shades of color, which shows that the proportion of color used in different churnings was estimated in a slip-shod manner. It is easy for any one to gauge the proportion so that the results will be uniform enough for all practical purposes, but how can uniformity be expected where rule-of-thumb methods are freely allowed or practised by managers? Some, no doubt, consider there is great difficulty on account of different churnings carrying cream not of the same consistency, but, when it is recollected that the great majority of factories working under similar conditions seldom or never are found to err, then it is a fair deduction that little or no serious effort has been made by them to overcome these exigencies.

Finish and Packing.—In some instances evidence of slovenliness is still found to exist. It is surprising that after telling some people what to do and showing them how to do it, they cannot pursue tidy methods. It is so easy to do a thing well and yet so very important, that it is hardly credible that some are yet to be found who overlook these details.

Mouldy Paper.—Judging by the experts' reports relating to dairying in other countries, no place is so free from this defect as Victoria. It is only occasionally that it comes under notice here and invariably the cause is traced to carelessness in the factory by leaving the parchment papers awaiting use lying about exposed to dust, or in damp corners of the building. When it is securely covered from dust and stored in a dry place no trouble is experienced. The sample produced is one well known to you all as *Penicillium glaucum*.

Weights.—The number of delinquencies in regard to weights has been greater during the past season than since the commencement of the export trade in butter. This is attributable to the paring of weights, and, in some few instances, to carelessness. The excuse that scales are out of order is too frequently made to always warrant sympathy. It is difficult to understand that so many scales kicked over the traces and refused to do accurate work this season. The number of scales found to have outlived their usefulness is a fairly constant factor from year to year, and the previous season having been so prolific and profitable, one would naturally

think renewals would be more extensive than usual at the beginning of the season. However, I need not dwell on this matter, as covering goods with an incorrect trade description is now listed as an offence. Any one offending in future will be dealt with under the provisions of the Commerce Act. The quantity held up last year, sample boxes of which were found short in weight, totalled 271 tons, or 2.24 per cent. of the whole, as compared with the previous season 185 tons, or 1.08 per cent., and 133 tons, or 0.87 per cent. for 1905-6. The fines imposed so far, have been only nominal, but if they be not found deterrent doubtless the Minister of Customs will increase the penalty, for he has the power to confiscate the goods if necessary. To make the excuse of faulty scales, is like a man seeking to condone an offence by pleading drunkenness.

With a view to definitely finding out the margin that should be allowed in butter for export, so that the weights would turn out correctly on reaching London, a large number of consignments was carefully weighed and marked prior to freezing and shipment, and the Agent-General was asked to have the weights carefully checked on their arrival. Unfortunately some parcels miscarried. However, the weights of half a dozen lots were checked with the following result:—

Vessel.	Date.	Moisture Contents.	Number of Boxes.	Average Loss.
		per cent.		
Suffolk	Nov. 26	14·08	12	10½ ozs. each
Oroya	Dec. 3	12·93	16	6½ " "
India	" 24	13·78	20	7½ " "
Ortona	" 17	13·45	12	7¼ " "
Omrah	" 31	13·35	13	6¾ " "
Wilcannia	" 13	13·77	14	1 " "

The moisture contents of these particular parcels were not checked; the percentages inserted therefore only show the average of the brands selected. From this table it will be seen that, to be on the safe side, *a margin of eight ounces at least should be provided.* The results regarding the first and last shipments are peculiar, and it is quite possible an error may have crept in at some stage between here and the other end.

MOISTURE CONTENTS.

The average moisture contents of all samples analyzed for the season came out at 13.44 per cent., against 13.925 per cent. for the previous season, and 13.725 per cent. for the year before. The districts compare as follows:—

Western Co-operative Factories	13.32 per cent.
" Private Factories	14.08 per cent.
N. and N. Eastern Co-operative Factories ...	13.45 per cent.
" " Private Factories ...	14.63 per cent.
Gippsland Co-operative Factories	13.51 per cent.
" Private Factories	13.69 per cent.
City Factories	13.08 per cent.

Gippsland Co-operative Factories showed an average of 0.22 per cent.
Gippsland Private Factories showed an average of 0.17 per cent.
City Factories showed an average of 0.14 per cent.

BORIC ACID.

It is somewhat refreshing to record the great diminution in the instances in which an excess of boric acid was found. The quantity stopped on

account of samples analyzed having been found to contain more than 0.5 per cent., was 4½ tons, as compared with 10 tons for the year before, and 28 tons for 1905-6 season. The average boric acid found in all samples analyzed was 0.23 per cent., as compared with 0.252 per cent. for the previous year.

Western District Co-operative Factories showed an average of 0.26 per cent.
Western District Private Factories showed an average of 0.23 per cent.
North and N. E. Co-operative Factories showed an average of 0.25 per cent.
North and N. E. Private Factories showed an average of 0.25 per cent.
Gippsland Co-operative Factories showed an average of 0.22 per cent.
Gippsland Private Factories showed an average of 0.17 per cent.
City Factories showed an average of 0.14 per cent.

Doubtless the last-mentioned average is influenced by the number of samples analyzed which were intended for markets prohibiting the use of boric acid. A serious check was encountered by our export butter on account of the authorities in the Phillipine Islands adopting the same laws as the United States, where the use of boric acid is prohibited. United States does not import butter, and has no export trade of any consequence. Being able to supply its own requirements, it can be understood that the use of boric acid is not so essential. Our shipments to Manila averaged about 200 tons yearly, and there was every indication of the trade developing. Now, according to exporters' evidence, we are knocked completely out of the market. This is most difficult to understand. I firmly believe that with under 0.05 per cent. boric acid, as permitted in many places, butter from any dairying country should reach the consumers in the Phillipine Islands in sounder, more palatable, and in more wholesome condition than without. On the other hand, if there is all round prohibition, then our manufacturers should, and must be able, to supply their requirements as well as any other dairying country. We should even be better able to do so on account of our nearness.

Another bombshell was recently cabled from London announcing the likelihood of prohibition there. I have no hesitation in saying that if this were suddenly done our export trade would receive a great blow. Our geographical position as regards that the chief market is the reverse of that of the Phillipines. Dairying countries in the Northern Hemisphere would be placed at a great advantage.

We all know that much can be done under the heading of cleanliness, in the treatment of supplies, pasteurization, the use of pure cultures, and refrigeration; but any one who has been out in the field will recognise the impossibility of controlling or checkng the action of each and every supplier to the butter factory. In order to manufacture uniform quality, supplies have to be pooled—this is one of the essentials of the modern factory system. When the product of one or more careless suppliers is mixed with that from those who supply it in good condition, subsequent changes are largely checked by the use of preservatives. I have very little sympathy with the use of preservatives, and none with their indiscriminate application. If harmful, even in the opinion of an infinitesimal minority, their gradual and early extinction is my earnest desire. At the same time we cannot close our eyes to the plain bald facts relating to the subject. My advice to the powers that be who contemplate this drastic innovation is to conduct experiments and see what the effect of prohibition would mean; as already stated I feel sure there can only be one result. Every factory manager, at some time or other, has carried out experiments to find out which brand of preservative on the market was the best, and was surprised to learn the extent to which the control sample without any had deteriorated by long keeping.

The evidence submitted from all parts of the world to the *Departmental Committee on Food Preservatives in England will have to be combated before the public can approve of the prohibition of boric acid.* The Committee consisted of the Right Hon. Sir Herbert Eustace Maxwell, Bart., M.P., Professor Edward Thorpe, Vice-President of the Royal Society, Herbert Timbrell Bulstrode, Esq., M.D., Francis Whittaker Tunnicliffe, Esq., M.D. It will be seen that, with the exception of the Chairman, the Committee was purely professional. Their investigations embraced all that was known on the subject from every corner of the globe, particularly from medical authorities. They recommended "that the only preservative permitted to be used in butter and margarine, be boric acid, or mixtures of boric acid and borax, to be used in proportions not exceeding 0.5 per cent., expressed as boric acid."

EXPERIMENTS.—*On the 13th of April last the Managers of Butter Factories in each District were asked by me to conduct experiments in the following terms:*—

"*Take from one churning portion of the butter and manufacture with the* addition of 0.5 per cent. boric acid preservative; another portion with 0.25 per cent.; a third with 0.1 per cent.; and a fourth without any preservative; also a similar set of samples with like quantities of saltpetre so that the result may be *tested at the Managers' Conference.*

"A cross set of experiments may be made with butter manufactured from pasteurized cream; and with butter to which no salt is added."

Mr. Proud, of Korumburra, kindly provided one set of samples, and Mr. Watson, of Colac, another. Three other sets were made by officers of the Department at country factories. Owing to the time of season it was impossible to secure cream of good quality to operate on.

The whole of the samples, ranging from two to five weeks old, have just been examined by the Government Graders at the Cool Stores.

The following is a table of comparisons:—

Brand.	No.	Salt.	Boric.	Saltpetre.	Grade.	Remarks.
		per cent.	per cent.	per cent.		
K. ..	A	3	No preservatives		89·7	Unpasteurized
	B	3	¼	nil	91·5	"
	C	3	½	"	92·5	"
	D	3	nil	¼	89·5	"
	E	3	"	½	89·75	"
	F	3	No preservatives		92·0	Pasteurized
	G	3	¼	...	92·8	"
	H	3	½	...	92·8	"
	I	3	1	...	91·6	"
	J	3	...	¼	92·1	"
	K	3	...	½	92·8	"
	L	3	...	1	90·3	"
Korumburra	H	No salt or preservatives			91·25	Unpasteurized
"	D	3	No preservatives		92·5	"
"	C	3	$\frac{1}{10}$	...	93·1	"
"	B	3	¼	...	94·25	"
"	A	3	½	...	94·5	"
"	G2	No salt	$\frac{1}{10}$	...	92·25	"
"	F2	"	¼	...	93·0	"
"	E2	"	½	...	93·25	"
"	I	3	...	¼	92·62	"
"	H	No salt or preservatives			90·75	Pasteurized
"	D	3	No preservatives		92·5	"
"	C	3	$\frac{1}{10}$	...	93·1	"
"	B	3	¼	...	93·75	"
"	A	3	½	...	93·5	"

Brand.	No.	Salt.	Boric.	Saltpetre.	Grade.	Remarks
		per cent.	per cent.	per cent.		
Korumburra	G3	No salt	1/16	...	91·5	Pasteurized
"	F3	"	1/4	...	92·5	"
"	E3	"	1/2	...	92·75	"
"	13	3	...	3/4	92·25	"
Colac ...	E	3	No preservatives		84·75	"
" ...	B	3	1/4	...	88.75	"
" ...	A	3	1/2	.	89·75	"
" ...	D	3	...	1/4	86·0	"
" ..	C	3	...	1/2	87·25	"
Orb ...	4	2	No preservatives		87·75	"
	3	2	1/4	...	90·0	
	2	2	1/2	..	90·25	"
	4a	2	No preservatives		92·25	"
	3a	2	...	1/4	91·87	"
	2a	2	.	1/2	91·25	"
	1	2	1/2	..	90·0	Unpasteurized
	1a	2	..	1/2	90·75	"
Cohuna .	4	No salt or preservatives			93·75	"
	3	No salt	1/8	...	94·75	"
	2	"	1/4	...	94·75	"
	1	"	1/2	. .	95·0	"
	7	"	...	1/8	94·5	"
	6	"	...	1/4	94·25	"
	5	"	...	1/2	94·25	"

The above proves that in almost every case the sample deteriorated most where no preservative was added at the time of manufacture; in connexion with the samples to which preservative was added in varying proportions, that with 0.5 per cent. kept the best; the others showing deterioration in proportion to the variation in the percentage of boric acid used.

The addition of saltpetre appears to have given negative results.

The samples of pasteurized butter kept better than the unpasteurized where no preservative was used.

All these samples are being kept till seven or eight weeks old when they will be again scored and appraised, and the results made known.

Cultures.

Some 116 pure cultures were issued by the Department from the Bacteriological Laboratory at the University, 72 to butter factories, and 44 to cheese factories. The fact that those who received them ordered subsequent supplies regularly is considered as evidence that they proved satisfactory.

Pasteurization.

Unfortunately, the staff is not large enough to permit much personal instruction being given during the height of the season, officers being fully engaged in inspectional work at the Port, but as soon as supplies slackened off, they were despatched to the country to afford factories benefit of their advice and experience, and give demonstrations in the pasteurization of home separator cream. Everywhere the results were successful and appreciated. In most instances, the proprietors of factories would not permit the temporary plant installed to be removed. It is somewhat a drawback that the present season is so slack, many factories having practically suspended operations. Whilst such is the case, attention will be mainly directed towards those now in work.

New Developments.

With a view to expanding trade, particularly the export of butter, the Minister of Agriculture subsidized a line of steamers so as to provide

regular and direct communication with Java and other Eastern ports. Ten steamers will leave Melbourne each year during the currency of the contract, and ample refrigerating space has been provided for butter and other perishable produce.

Since this time last year, certain new appliances have come into use, the most notable being the combined churn and worker. A number of factories has already installed these labor-saving contrivances. The results are so far satisfactory, and it appears as if the arrangement of the butter factories for the future would be on a markedly different basis, instead of separate rooms being provided for churns and butterworkers, the two operations will be combined, and a saving of space and labor effected.

A few weeks ago, a scales and apparatus for determining the percentage of moisture in butter were shown to me. Instead of the orthodox weights, involving subsequent intricate calculation, the weights provided with the balance indicated the percentages of moisture without recourse to figures. In other words, it is somewhat similar in principle to the Babcock tester which shows at a glance the percentage of butterfat in the cream or milk. The usefulness of the Babcock system would not have come into universal use if each separate reading entailed complex calculations.

Conclusion.

In conclusion, perhaps, you may consider my remarks as to defects as having a general application. So they have in a sense, but it does not follow that they are all present in any one case only. Many of our butters leave nothing to be desired, but what I wish to impress upon you is that the blemishes enumerated are far too common. I particularly desire you to realize that competition from abroad is each year becoming keener, and that therefore we cannot afford to stand still. By attention to what has already been said, the quality of Victorian butter will make another step forward and keep us in the forefront of the world's producers.

Replies to Questions.

The following replies were given in answer to questions asked at the Conference:—

1. Mottle:—Mottled butter is caused by not distributing and mixing the salt evenly throughout the mass. That portion of the butter with which no salt has been brought in contact fades or becomes white in appearance as compared with the salted portion. When pronounced zebra like variations are discernible the butter is called "streaky." Faintly marbled, it is termed "mottled," and if found in clearly defined round spots it is caused by the omission to strain cream partly churned *en route* to the place of manufacture. This latter defect is seldom met with as most factories strain the cream through a fine wire gauze sieve, and manufacture the marbles, beans, peas, and wheat-sized churned particles into an inferior grade butter. Soft butter requires less working than hard.

An experiment is necessary in each factory as the time required to thoroughly incorporate the salt (or preservative in the case of unsalted butter) depends upon the speed of the butter-working machine, its type, whether having two rollers or one, the nearness of roller flutes to the table, and the method adopted by the attendant in turning the butter, whether he follows the system of folding in edges only, or rolling and feeding the butter end on. A sample of about a pound can be removed after working has continued for three minutes from commencement of salt mixing, another three and a half minutes, a third four minutes, and so on until the period for thorough working is passed. By cutting these samples on the following morning the exact period necessary for a satisfactory result can be noted and followed for the future. A similar experiment is necessary when the butter is hard, of medium consistency, or soft. Having decided these points, printed instructions may be hung under the clock upon the wall. As the operation is purely

mechanical, these directions if religiously followed leave nothing to chance, there is no necessity to exercise judgment, and it is here many reputable factories become involved.

2. Weights :—The scales at the Government Cool Stores are very sensitive, and are checked a number of times each day, certificates of accuracy being secured from time to time. The experimental boxes forwarded to London to be checked there were in every instance weighed by the Department's expert weigher, and checked by the chief grader. It was strange that an average loss of 10½ ounces should occur in one instance, and only one ounce in another. (An Inspector of Weights and Measures visited the Freezing Works immediately after my remarks on this discussion appeared in the press and tested all the scales and weights in the building and found them correct.—R. C.)

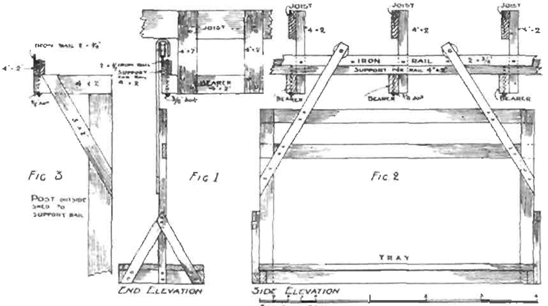
A member of the Association suggested that the method of refrigeration on the steamer may have had something to do with the abnormal loss shown in one parcel compared with the other. The humidity of the chamber may have influenced the loss considerably. I stated that this aspect of the matter would have my attention by further experiment.

3. Grading :—34 per cent. of the butter exported last season graded "Superfine," 51 per cent. "First Grade," 13 per cent. "Second Grade," and 1 per cent "Third Grade," and "Pastry"; against 60 per cent. "Superfine," 35 per cent. "First Grade," and 4 per cent. "Second Grade" and lower for the season before. It is well to remember that the interpretation of grades was altered at the commencement of this season to "Superfine" from a minimum of 94 points to 95 points, whilst "First Grade" was raised from a minimum of 88 to 90 points and so on. By comparing last season's percentages on the present season's basis of points, 52 per cent. of last year's butter would have been included in the "Superfine Grade" instead of 60 per cent., 40 per cent. in the "First Grade" instead of 35 per cent., and 8 per cent "Second Grade" instead of 4 per cent.

OVERHEAD CARRIER FOR MILKING SHEDS.

R. T. Archer, Assistant Dairy Expert.

To enable the dairyman to obtain the best possible returns from the capital and energy devoted to his work he must adopt any labor-saving



OVERHEAD CARRIER FOR MILKING SHEDS.

appliance that will assist in economical production. The accompanying drawings illustrate a carrier for the conveyance of milk from the shed to

the dairy, fodder from feedhouse to cows, or manure from shed to pit. Usually it takes two men to carry a can of milk, but with the overhead tram system under review one man may convey three cans at once to the dairy. Such an arrangement is in operation at the farm of Mr. George Matheson, Moyarra, South Gippsland, who is one of the most successful settlers in that district. Figs. 1 and 2 show how the carrier is suspended from the floor joists of the loft; the end elevation of the carrier, which is suspended by a grooved roller on an iron rail, is also shown. The rail is 2 in. x $\frac{3}{8}$ in. flat iron screwed or bolted to 4 in. x 2 in. hardwood. It may be easier to use angle iron in place of flat iron. The suspenders of the carriers should be either 3 in. x 2 in. hardwood or $\frac{1}{2}$-in. iron with a curve over the top through which the spindle of the roller will pass. If there are any sharp curves on the line the trolly wheels should not be more than 18 inches or 2 feet apart. If the line is straight they would be better further apart. Hooks with grooved pulleys attached may be used instead of the tray where required. Fig. 3 shows how to suspend the overhead tram from posts outside the shed. The supports for the iron rail may be bolted direct on to bearer.

THE ORCHARD.

James Lang, Harcourt.

Pruning will be the chief work for the month. The object and aims of pruning are to maintain a moderately good growth in the tree, and at the same time produce good crops of marketable fruit. Trees that are not pruned will only produce good fruit in the earlier stages of their growth, while the tree is small and the growth vigorous. As it gets older the fruit becomes small and unprofitable; hence, the object of pruning is to maintain an equal balance between the growth and fruit-bearing qualities of the tree. A one year old tree just planted should have the leading shoot cut back to about two feet from the ground. This will form the future stem of the tree, and in the spring when the buds begin to shoot, leave the three top buds, and rub off all the buds below. These three buds will form the foundation of the tree and should be allowed to grow unchecked throughout the summer. During the following winter these shoots should be shortened back; cut off say two-thirds of their growth, always cutting back to an outside bud. In the next spring two shoots may be allowed to grow from each branch; this treatment will give six branches, and these will form the main branches of the tree. To form a well balanced head the branches should be spaced as nearly as possible at equal distances from each other.

During the future growth of the tree, additional branches may be left as required, taking care that they are not overcrowded. Lateral branches will make their appearance during the third and fourth years. Those growing inside should be well thinned out, leaving a few only to fill up the body of the tree, whilst of those growing outwards the strongest may be retained where required to further extend the tree. The leading

shoots will also require shortening back, leaving the strongest shoots longest, and cutting the weaker shoots back a little shorter. Where a branch makes a strong growth and takes a decided lead from the others, it should be pinched back in the early summer. This will check the growth, and allow the weaker branches to grow more vigorously.

Where trees are growing in an exposed situation the prevailing winds should be taken into consideration when pruning, otherwise they will be blown all to one particular side. The pruner should counteract this as much as possible by pruning to an outside bud on the windy side, and an inside bud on the sheltered side.

Many varieties of apples and pears form natural fruit spurs without any trouble; others again, such as Jonathan and Rome Beauty, grow to laterals. This is the point where many pruners fail. They cut off all the laterals with the expectation that fruit spurs will naturally follow, but instead only thin spray wood makes its appearance. This is again cut off, and so the process goes on until the lower portion of the tree becomes quite bare and devoid of both fruit spurs and leaves, and the whole of the growth has been forced into the extremities of the branches, which gives the tree the appearance of a broom. Instead of cutting off all these lateral shoots, they should be moderately thinned out, and the full length of the ones that are left should be retained, not being cut back at all. The following summer fruit buds will develop along the whole length of these shoots, and will become permanent fruit spurs. They should be gradually shortened back a little every year as the growth of the tree expands, and the tree will then be furnished with fruit bearing wood right from the fork. Should too many of these lateral shoots have been left to form fruit spurs, they can always be thinned out or shortened back and so help to regulate the crop of fruit. Fruit spurs of trees in full bearing should be thinned out every year, if good quality fruit is required. Unless this is done, the fruit spurs increase so rapidly that the tree is unable to properly mature the crop of fruit that sets, with the result that it is very small and of little value. Again, many trees such as the Winter Nelis pear, where the spurs have not been thinned, bloom so profusely that the tree exhausts itself in blooming, and is unable to set any fruit. Orchardists should therefore study the habits of the different varieties of trees they are dealing with, and regulate the fruit spurs according to the capacity of the tree to bear a crop of fruit of the best quality.

In pruning peach trees, it is necessary that a continuous supply of young wood should be maintained every year to give a supply of fruit, as it is borne on the wood of the preceding year. In the Harcourt district there are peach trees 40 years old still strong and vigorous, and bearing heavy crops of fruit, and from present appearances are likely to go on for another 40 years. Most peach growers find a difficulty in maintaining a supply of young wood in the lower part of the tree, as there is always a tendency for the young growth in the body of the tree to die out, the young growths all getting to the top. Where this is the case it is better to head it well back in the winter, and in the spring young growths will shoot from the shortened branches. These should be thinned out, leaving just sufficient to form a well balanced head.

Continue planting trees during the month. The seasonable rains have given the ground a good soaking, and it is now in good condition for planting.

DISEASES OF THE SKIN.

(Continued from page 343.)

S. S. Cameron, M.R.C.V.S., Chief Veterinary Officer.

PARASITIC SKIN DISEASES.—I. ANIMAL PARASITES.—Fly-blow on Sheep—Cattle Warbles—Fleas (*pulices*)—Lice (*Hæmatopinus*). Fowl Lice on Animals—Ticks, horse tick (*Ixodes Americanus* and *hippobosca equina*), cattle tick (*Ixodes bovis*), dog tick (*Ixodes ricinus*), sheep tick (*melophagus ovinus*), fowl tick (*Argas Americanus*)—Mange or Scabies (*sarcoptes, psoroptes,* and *symbiotes*)—Acne (*demodex folliculorum*). II.—VEGETABLE PARASITES.—Dermatomycosis, Ringworm (*trichophyton tonsurans*)—Queensland Mange or Parasitic Eczema (*trichophyton epilans*).

II.—PARASITIC SKIN DISEASES.

I.—ANIMAL PARASITES.

Fly-blow on Sheep.

It is only during recent years that fly-blow has become a pest amongst Australian sheep. Until the nineties fly-blown sheep were practically unknown but since the break up of the drought in 1902 they have become in some districts so common as to constitute a serious menace to profitable sheep husbandry. This sudden incidence of the trouble has been put down to the unusually cool summers experienced for it is believed that a shade temperature of 112 degrees will prevent the development of the larvæ of the fly concerned, and this temperature has not been reached in many parts of Australia during the period referred to. A more likely hypothesis is that one of the more pernicious varieties of flies in this respect has only lately been introduced, probably through the medium of imported sheep, a large number of which have arrived in Australia since the boom in the mutton breeds of sheep commenced.

The flies mostly concerned in the production of this trouble belong to the genus *Lucilia* which are characterized by their bright metallic colours, short and round abdomen, wide set wings and a soft proboscis. The most pernicious of the genus are :—

(*a*) *Lucilia macallaria*—" It measures 9 mm. to 10 mm. (one-third of an inch) and is recognised by its blue thorax streaked with three darker blue bands of a purple tint; the pads are black and the wings brown at the base." (Neumann.)

(*b*) *Lucilia sericata* is somewhat similar but golden-green in colour.

The trouble is most prevalent during mild winter and spring weather from July onwards. At these seasons the immature grass produces a laxative effect, and the tail and rump wool is so "dirtied" as to attract the fly, and be a suitable spot for the deposition of the blow. It is also well known that the fly itself is most active in sultry weather and after rain, and at such times a sharp look-out should be kept for the uneasy restlessness, stamping, biting, tailshaking, and running about, which are the first indications of the torment of burrowing maggots. Sheep with dirty tails and rumps from diarrhœa should be specially watched. If the fly is very bad, and it is possible to change the pasture, this should be done, or all sheep showing signs of diarrhœa should be drafted and changed.

TREATMENT.—The curative treatment of "the fly" so far as destruction of the maggots is concerned is simplicity itself, for the pests are extremely sensitive to the action of numerous agents, such as spirit of tar, kerosene emulsion, solution of creolin, or any of the phenyle dips.

Tobacco water and arsenic solution will also kill them, but watery solutions do not blend with the greasy wool and skin, and hence they do not penetrate sufficiently far. The drawback to curative treatment, however, is that there are usually successive invasions of the fly, because the old scalded spot or wound is in suitable condition for the deposition and development of successive "blows," so that the treatment involves a lot of trouble, and may have to be continuously repeated. Such repetition of treatment is practically impossible on extensive sheep runs, and it is impracticable in a large number of cases to apply medicinal agents even once. Many of the sheep are never seen for days together, and it hence becomes the supreme object to procure the prevention of the attack of the fly. Almost any substance with a pungent aroma—kerosene, eucalyptus oil, oil of rue, phenyle, creolin, tincture of assafœtida, and the like—will deter the fly, but their effects are usually evanescent. There is one substance, however—fish oil—the fœtid aroma of which persists for months, and it is said that a few drops of it sprinkled on the wool in the region of the tail will prevent the attack of flies throughout the season.

The fish oil recommended is the ordinary fish oil of commerce procurable from any wholesale chemist. It is sometimes sold under the name of train oil. When freshly prepared it is comparatively clear oil, dark brown in colour, and non-volatile, but later on it may develop flocculence or sediment. The disagreeable penetrating and persistent odour also increases the longer it is kept on account of the development in it, by oxidation of the oil, of a substance called valerianic acid, on which its odour depends, and which is also present in minute quantities in decaying cheese. It is this quality or power to keep on forming the stinking and acrid valerianic acid when exposed to the air which renders it superior to most other substances as a deterrent of flow-flies. As the odour volatalises it is replenished, so to speak, by further formation of acid, and so long as traces of the oil remain in the wool—and the oil itself does not volatilise or dissipate readily—so long will the odour persist and deter attacks of the fly.

Another dressing that has been used with success in keeping the sheep to which it was applied free from attacks for the season is—One part crude carbolic acid crystals dissolved in fifty parts of crude vaseline. To this mixture add one part sulphur to two parts of the mixture. In this case it is probably the gradual decomposition of the sulphur and the consequent continuous formation of sulphurous acid gas (SO_2) which accounts for the lengthened deterrent effect.

Cattle Warbles.

The Warble fly has not yet gained a footing in Australia. Animals have at various times landed from England with warble maggots in their skins, the latest occasions being in 1903 (Melbourne), 1904 (Hobart) and 1908 (Sydney). During the period of detention in quarantine, however, the maggots have been successfully destroyed and the continent thus saved from the enormous financial losses which this parasite has been responsible for in many other countries.[1]

This loss occurs mainly through the depreciation in value of hides on account of the perforations in them.

In view of the possibility of the seaward guard, which up to the present has been effective, being evaded a short description of cattle warbles is here introduced.

The fly belongs to the same family as the horse bot fly and is called *Œstrus* or *Hypoderma bovis*. It is somewhat like a bumble bee in

appearance, its body being banded with black white and yellow. The female fly is most active during the summer months. It deposits the eggs on the skin in the region of the loins and back, where they hatch out forming larvæ. These larvæ pierce the skin and become lodged in the subcutaneous tissue where they remain for about nine months (July to March in Europe). While undergoing their nine months' development they irritate the tissues in which they are lodged which become inflamed and infiltrated with pus, and a nodule is formed which is usually the size of a coat button but may become as large as a pigeon's egg. The surface of this nodule is marked by a small black depression about the size of a pin's head which is the perforation through which the larva entered and through which, on its attaining maturity it will leave. The exit is made by the tail end of the maggot(?) being pushed through the opening first. The nodules are ordinarily found on the upper parts of the body—shoulders, back and loins, and they may number from ten or a dozen up to one hundred. When numerous the affected animal exhibits great uneasiness and distress—bellows, tosses the tail and is continually on the move—and severe emaciation follows.

FEMALE WARBLE FLY.
(Twice natural size.)

WARBLE MAGGOT (FULL GROWN).
(Twice natural size).

TREATMENT consists in removing and destroying the larvæ as they become ripened by squeezing them out or by lancing the nodules. This is also a preventive measure as the following year's crop is done away with. Some greasy mixture should be applied as soon as the warbles are discerned on the skin, the object being to plug the breathing hole and so kill the maggot. Sulphur or kerosene mixed with the fatty substance renders the dressing still more effective. To deter the female fly the skin on the parts subject to attack should be dressed with tar liniment, carbolic acid solution, phenyle, solution of assafœtida, decoction of walnut leaves or fish oil.

Fleas (Pulices).

Of domestic animals fleas are mostly seen on the dog and cat, which have each a distinct flea parasite on them; that of the dog is the *Pulex canis* and that of the cat *Pulex felis*. Fleas bite through the skin and suck blood; they thus cause itching and cutaneous eruptions.

TREATMENT.—For the destruction and removal of fleas Persian insect powder (powdered pyrethrum) is one of the best agents to use. Washing the animal with a two per cent. solution of carbolic acid or creolin is also useful, as also is shampooing with the Stavesacre decoction recommended for lice.

Lice (Hæmatopinus).

Most domestic animals nourish a particular species of lice which do not live for any length of time on other animals than their regular hosts.

The special lice of different domestic animals are as follow:—Horse, *Hæmatopinus equi;* Cattle, *H. eurysternus* and *tenuirostris;* Swine, *H. suis;* Dog, *H. pilifer.*

Generally lice only develop on poorly fed, weak and debilitated animals, and their presence is almost always indicative of want of attention to the skin and dirty surroundings; although ox lice are often found on well-conditioned subjects. The eggs (nits) are not deposited on the skin but are affixed to the hair of the affected animal. They produce itchiness and shedding of the coat or hair in patches. Sometimes the surface layer of the skin peels off over affected areas and the skin may become thickened, corrugated, and covered with much scurf. The irritability produced has its effect on the condition of the animal which becomes dull and thriftless.

TREATMENT.—Many washes having kerosene, creosote, carbolic acid, phenyle, tobacco or the like insecticides as their active principle may be used with success; but the most efficacious dressing that the author has used for all classes of animals is a Stavesacre shampoo made according to the following prescription:—

Stavesacre seeds	½ lb.
Soft soap	1 lb.
Water	4 quarts

Add the seeds and soap to the water and boil slowly down to two quarts, stirring continuously until the soap is dissolved.

This decoction is to be applied with water as a shampoo until a good lather is produced which may be allowed to dry on and be washed off with water after a few hours. A quarter-pint of kerosene added to the decoction increases its efficacy.

To destroy the nits vinegar may be added in the proportion of two ounces to the quart of decoction.

Fowl Lice on Animals.

The insects commonly known as fowl lice are not really lice but acari (mites) known scientifically as *Dermanyssus avium.* They are found on all domestic fowls but particularly chickens, pigeons and house birds. They are nocturnal in their attack, resorting during the day to cracks and crevices in the perches and floors and walls of the fowlhouses, and only spreading on to the poultry at night time. They do not seem to prejudicially affect the birds unless they are present in large numbers, when young birds loose flesh and may die from exhaustion.

These insects are of chief concern to the stock-owner because they overrun horses, cattle and other animals that are stabled near fowl pens or within their reach. In horses particularly, and to a less extent in other animals, they occasion great uneasiness and irritability, and sometimes give rise to the formation of scabs simulating mange. A case is recorded in which a number of cows were treated for fowl lice unsuccessfully for several years until the trouble disappeared spontaneously after the destruction of several swallows' nests that were in the cowshed.

TREATMENT is the same as that recommended above for ordinary lousiness.

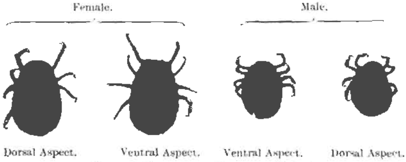
Ticks.

Ticks are insects resembling acari (mites) in form but they are larger, the females when sexually mature attaining to the size of a split pea or castor oil seed and resembling the latter very much in appearance. They seldom attack stabled or housed animals but only those at pasture as their natural habitat during part of their life cycle is in shady situations among grass and scrub.

Each animal has its special variety of tick. That of the *Horse* is the *Ixodes Americanus* found in certain parts of America and of recent years particularly prevalent in South Africa but as yet not introduced into Australia. The *cattle tick* (*Ixodes bovis*) is of special importance on account of the part it plays in the causation of Tick fever or Redwater of cattle, and it will be fully considered when that disease is dealt with. The *Dog tick* (*Ixodes ricinus*) also attacks cattle and sheep. It is responsible for many fatalities amongst shepherds' dogs in the bush, a fatal paralysis quickly supervening on the bite of the insect. In such cases the most effective line of treatment is the giving of stimulants to keep the animal going until the effect of the poison, which the insect apparently injects, passes off. Injections under the skin of five-drop doses of liquor strychnia every half hour is recommended. The offending tick or ticks should also be searched for and cut out, or made to loosen hold by inverting a bottle of turpentine or ammonia over each. If pulled out the proboscis is usually broken off and left in, in which case the injection of poison appears to continue for some time.

Closely allied to the true ticks are the so-called horse, sheep and fowl ticks. In the horse the tick-like insects (*Hippobosca equina*) locate themselves at the base of the tail, along the belly and round the anus, and cause considerable irritation by biting. The *sheep tick* (*Malophagus ovinus*) is well known. They are bloodsuckers and produce considerable irritation of the skin, causing the sheep to rub and bite their fleeces so damaging the wool. They are much more prevalent during moist seasons than dry ones. The *fowl tick* (*Argas Americanus*) was introduced into Australia some years back and it has spread so rapidly that great harm has resulted to the poultry industry throughout large areas in South Australia, and the North-western and other districts of Victoria. Special quarantine and inspection regulations are in operation to limit the spread of the pest.

DIAGRAMS OF FOWL TICK (*Argas Americanus*).



(Two and three-quarter times natural size.)

TREATMENT.—Ticks of all kinds are easily destroyed by many medicinal agents such as those mentioned for the destruction of lice. Kerosene and carbolic acid are particularly effective. For sheep any of the arsenic or tar-product sheep dips are used with success especially after shearing. The special dips that have been found most effective for cattle tick will be fully described when that scourge is being dealt with.

In regard to fowl tick it has been noticed that where there are ant hills near the hen-roost the fowls are little troubled with the pest. The greatest drawback to the eradication of the disease is perhaps the fact that ticks will survive for months without contact with fowls or birds of any kind so that the killing off of infested fowls is not sufficient. The destruction by fire of the infested fowl houses fences and other harbor for the ticks is necessary.

(To be continued.)

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THE BREEDING, SELECTION, AND CARE OF THE DAIRY COW.

J. M. B. Connor, Dairy Supervisor.

Methods of breeding domesticated cattle for the purposes to which they are especially adapted have been practised from the earliest times. The oldest writers on cattle breeding give directions for the breeding and improvement of the dairy cow, and their precepts are often repeated by modern authorities as being incapable of improvement at the present day.

Acquired Characteristics from Parents.

It has long been known that the characteristics of the parents are transmitted to their offspring, and the expression "Like produces like" is often used. There are, however, many apparent exceptions to this law; but a close examination into all the facts relating to hereditary transmission will prove that it is not only constant in its action, but extends to every feature of the organization. The uniformity observed in the various breeds of cattle is the result of the inheritance of the characters that adapt them to the conditions under which they were originated and developed. Some of the most striking illustrations of this form of heredity are to be found in the development of the improved breeds of dairy cattle.

Every farmer, in attempting to breed for the improvement of his herd, ought to bear in mind that the hereditary power of the animal, that is, the power of transmitting its qualities to its offspring, is constantly cumulative; provided the animal has been bred on correct lines. For example, the general law that "Like produces like," is undoubtedly correct upon general principles; the difficulty is in a want of knowledge as to the inherited qualities and characteristics of the two animals which are brought together. They may appear to the naked eye to be alike, and yet there may be, and often are, very marked differences in yielding capacity and other such-like qualities. If they in turn have been bred from parents with "like" qualities and are alike in all their peculiarities, the offspring will not only be like the parents, but will have their characteristics more strongly marked; that is, the essential characteristics in which the parents are alike will be intensified in the offspring—the power

of transmitting its peculiar qualities will become stronger and stronger. But, on the other hand, if the parents are not alike, and there are any essential differences between the male and female, instead of the power of heredity becoming stronger and stronger with every successive generation, it will become weaker and very greatly reduced, so that it cannot be depended upon at all as a practical aid to breeding what is wanted.

Dairy farmers are frequently heard to say that they care nothing about pedigree; they desire to see the bull, and then they can tell whether they want to breed from him or not. There can be no greater mistake made, for the reason that this hereditary power is latent—is hidden in the system. It cannot be detected by the eye, it cannot be detected by any known law, except that of hereditary influence, in other words, pedigree. If the farmer knows positively the peculiar characteristics of all the ancestors of the animals he is about to breed from, then he can tell with some degree of certainty what the result is likely to be. A pedigree in itself may not be worth the paper it is written upon, unless you know the characters of the ancestry recorded in it; that

1. "OLD MILKMAID" AND SIX OF HER PROGENY.

"Old Milkmaid" was bred by the late Hon. J. H. Connor, M.L.C., and is now owned by Mr. W. Woodmason, Malvern.

is, unless you know that in each case the male and female in each successive generation have been alike in their good qualities. This fact is fully illustrated in the photograph reproduced on this page; No. 6 in the group of the cows is "Old Milkmaid," now 18 years of age. She was bred by my late father, the Hon. J. H. Connor, M.L.C., at his stud farm at Beeac, and sold to Mr. W. Woodmason, of Malvern, after competing in the butter test competition at the Royal Show, Melbourne, in 1898. On that occasion she was awarded second place, in a big field, making 4 lbs. 5½ oz. of butter in 48 hours. At the Royal Show, 1899, she divided second prize, making 2 lbs. of butter in 24 hours; also winning the gold medal for best quality and quantity combined. At the Royal Show, 1901 (when 11 years old) she again made 2 lbs. butter in 24 hours. She has bred regularly every year since she was 2 years old, and Mr. Woodmason has twelve valuable female descendants from her, besides having sold over £100 worth of her progeny, not including bull calves. Before selling this cow my father won the dairy cow competition prizes at Geelong and Colac Agricultural Shows,

besides rearing five valuable calves from her. In looking at the photograph one cannot lose sight of the great resemblance between "Old Milkmaid" and her descendants. They have bred true to type, and have the old cow's characteristics strongly marked, and are all heavy milkers. Those shown in the illustration are as follow:—

1. Milkmaid of Melrose No. 114; Sire Laddie Fowler, Imp.
2. Milkmaid of Melrose No. 165; Sire Handsome Herr.
3. Milkmaid of Melrose No. 77; Sire Defender, Imp.
4. Milkmaid of Melrose No. 42; Sire Laddie Thriler, Imp.
5. Milkmaid of Melrose No. 187; Sire Handsome Herr.
6. "Old Milkmaid"; Sire Duke.
7. Milkmaid of Melrose; Sire Handsome Herr.

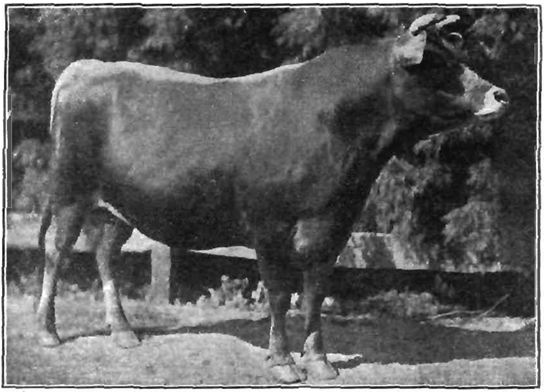
Heredity.

To clearly illustrate this, attention is directed to the photograph of the renowned sire "Lady Superior's Progress," owned by Mr. W. Woodmason; sire "Progress 3rd," Imported, 1575 J.H.B.; dam, "Pretty Lady Superior"; five times first and Champion Jersey Bull at the Melbourne Royal Show, also First and Champion at Adelaide, and never beaten in the show ring. This sire had the hereditary power strongly concentrated in his system, being the offspring of parents, grand parents and great grandparents which were noted for their heavy milking characteristics, and he stamped his progeny likewise.

In breeding, special regard should be paid to the outline structure, or good points of the bull to be used in the herd. He should have a small, well set head (see No. 3), large docile eye, rounded ribs, straight legs, small bones, and sound internal organs. The breeder should bear in mind that the hereditary power already referred to, which is so valuable and important and on which the whole improvement must depend, is hidden, and cannot be detected by the eye. That shows the value of a good pedigree, which guarantees the quality of the ancestry. The pedigree ought to be studied on both sides, and in that way and in that way alone, can we breed with any degree of certainty in regard to the result. There is no doubt, in my judgment, that the male parent, whether stallion, boar, ram or bull, exercises a greater influence on the offspring than the mother does. It is well known to the breeders of Ayrshire cattle that the sire has an important influence upon the form and functional activity of the udder, and the position and false teats or nipples of the bull are believed to furnish an indication of the milking qualities he will be likely to transmit. It is of the utmost importance that well bred, well formed sires, be employed for the improvement of our dairy herds.

Amongst dairymen, one often hears the expression, "The bull is half the herd." This is literally true and it is a great pity that it is not more fully recognised. Of the qualities transmitted to the calf the bull furnishes half. The cow influences the character of but one calf a year, the bull passes on his characteristics to many calves, to all calves of an ordinary sized herd. When he is selected, half the character of all the calves is determined. In a herd of 30 cows his influence is as much as that of the whole number of cows put together. If the bull selected is descended from parents possessed with a pure pedigree and heavy milking capabilities, he will naturally be superior to the cows he is mated with in the ordinary grade dairy herd of cows, and the

characteristics he transmits to the calves will be of more value and higher quality than those that come from the dam's side: in this sense also, the bull will be more than half the herd. If the bull is kept with the same cows several years, each year he starts out a generation of calves, more than half of whose qualities were transmitted by him. But his successor, of similar type and quality, mated to those improved heifer calves, carries the improvement of the herd still further, and eliminates defects that have been derived from the dam's side. From generation to generation the succession of improved sires introduced into dairy herds goes on increasing and intensifying the improvement of the cows. It is therefore only reasonable to expect that the bull used, may thus, within a few years and at slight expense, completely transform a dairy herd of cows and more than double its profit.



2. "LADY SUPERIOR'S PROGRESS."
The property of Mr. W. Woodmason.

I have heard farmers ascribe the principal influence to the bull, whilst others consider it is chiefly due to the female, and there are not wanting illustrations that appear to support this theory. The freaks of nature in these respects are certainly very curious, and farmers are often more struck by a remarkable exception than by the rule, and are disposed to found their theories accordingly. Facts, however, appear rather to support an opposite doctrine. For example, the offspring of the male ass and the mare resembles the former more than the latter. The long ears, spare muscular development, narrow feet, and sluggish action, are almost equal peculiarities of the mule and the ass, and strongly attest the former's origin. Incidentally, it is also surprising, too, what large colts small mares will breed when begotten by horses of great size. Pony mares will thus rear stout cobs and galloways, and well bred mares, about 15 hands high, will throw carriage horses of good size, if bred to

a powerful stallion. The improvement that can be effected by means of introducing a Shorthorn or Hereford bull in a herd of ordinary cows, is strikingly shown. In sheep, the influence of the ram is, if possible, still more clearly illustrated; the cross between the Lincoln or Leicester ram and the ordinary grade ewe greatly resembles the ram in appearance, size, and fattening qualities.

In animals we do not notice so accurately the features of the face, but are attracted far more by the resemblance offered by the configuration of the body, and thus we are more impressed with the greater the likeness the offspring bears to the sire. Stop the indiscriminate breeding of all kinds and any kind of breeds of cattle in one herd. Select a breed

3. A TYPICAL SIRE'S HEAD.

least adapted to the conditions which exist, and get a sire of the best dairy breeding qualities to be obtained regardless of cost. Use him for at least three seasons and breed the heifer calves back to a sire of the same family blood and as far removed from kinship as possible, thereby freshening the herd with new blood, without weakening it. There is no surer way to produce scrubbers than to mix beef and milk breeds and get antagonistic forces and purposes into close contact. While it is quite true that a common cow can be bred up and made far better, the continued improvement is only accomplished by keeping to one line of breeding—that of pure-bred sires of the same breed every time. Never waste time by first trying one breed and then another. This unsatisfactory method is very noticeable in the dairy herds throughout the State. In a herd of cows, nine out of ten times, as herds go, one will

find traces of nearly all the breeds in existence, and this majority of cows is the class that produces less than 300 gallons of milk each a year, when by proper care and breeding they should produce between 500 and 600 gallons.

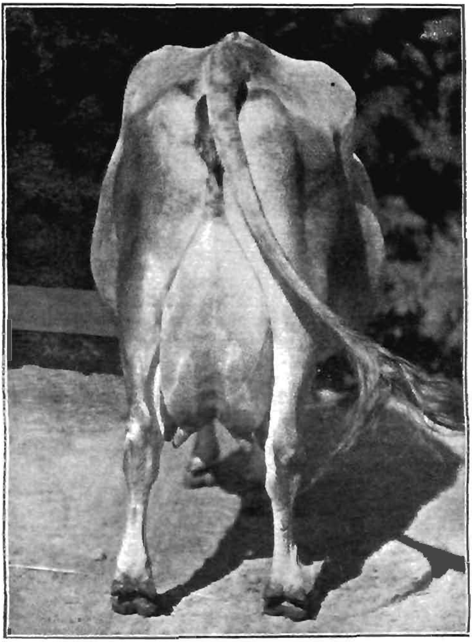
A man will not pay high and fancy prices for mixed breeds of any kind of stock—it is the pure breeds that are wanted first. One often hears the argument used, that a cross makes the better animal. Is it so, or is the cross of two pure breeds a compromise? Granted that the cross is better the first time; what is it the next? If breeding is continued on these lines the result will be a repetition of the old, old story. Two breeds crossed with two distinct purposes—one beneficent, for ever giving; the other miserly, for ever storing up, only to give back what is eaten in beef. The dual-purpose cow from a theoretical point of view sounds good. It is very well to say that we want to breed a cow that will give a large flow of milk, and at the same time produce a calf, which, if it happens to be a steer, will turn out to be a fattener of as good a quality as though it had been dropped by a good beef cow. The trouble in most cases is that nearly all farmers like the look of a nice, fat cow better than they do one of a strong dairy type, which is usually not a model of beauty and symmetry. It is quite true that there are occasionally individuals in these breeds that are fair milkers; sometimes even excellent milkers are found. But after all they are few in number, and the worst of it all is that even though you do get a bull from a good milk strain, that bull is most likely to produce calves totally unsuited for the dairy. What else can one expect when breeding on these lines? Have not these cows and bulls been bred for beef, generation after generation? Are they not valued because of their square, beefy type? The great trouble with most dairymen is that they do not know what their cows yield. If they would keep a record of the yields of their cows and test the same, they would soon learn that dairy blood counts. If you were to ask even the strongest advocate of the general purpose cow what constitutes the standard, or ask him to minutely describe to you what to look for when buying such an animal, it is safe to say he could not do so, for he does not know himself. There is no standard to go by and the whole thing resolves itself into luck.

We may, therefore, from these and other similar facts, which could be further extended, be justified in concluding that, so far as regards the size, general appearance, external form, and muscular development, the influence of the male is superior and stronger to that of the female. Yet it must be clearly understood, that I do not wish it to be inferred by the stress I have laid upon the importance of the selection of the bull, that the qualities of the female are a matter of indifference. So far from this being the case, I would censure in the strongest terms, any neglect displayed in the selection of the qualifications necessary in the cow to be used for breeding purposes. It is of the utmost importance to study the breeding and milking qualifications of the cow as those of the bull, though the respective excellencies may not be the same. Hereditary disease, and weakness of constitution are much more likely to be transmitted to the offspring by the cow than the bull, which is in keeping with the long and intimate connexion maintained between the cow and her calf, both before and after birth, till weaning takes place. As the same blood nourishes both, each is likely to become affected by any unhealthy change in this fluid. Soundness of constitution is, there-

fore, an indispensable requisite in the cow. The fact, however, of the male animal begetting fifty to sixty offspring in the course of a year, whilst the female seldom produces more than one, must, and always will, cause improvements in breeds of animals to be principally effected by means of the male used in the herds.

Selection of Animals for Breeding.

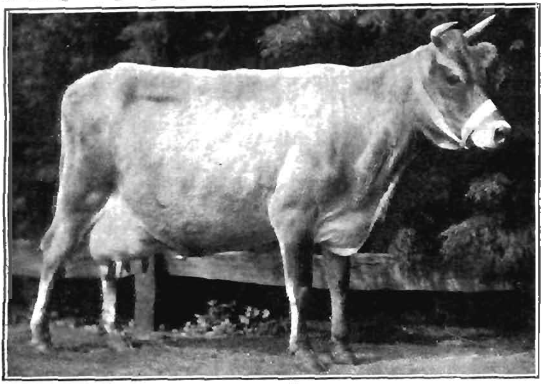
The animals selected for breeding must be adapted for some well defined purpose in the system of management, and to the conditions in which they are to be placed. The principal causes of animal variation



4. A STUDY IN FORM OF UDDER AND HIND QUARTERS.

are climate, food, and habit. Where practicable, it is always wise to procure stock from similar country, as it is necessary to start with stock suitable to one's district. All improvements in both animals and plants are due to the natural laws of variation. The slightest differences of

form or organization are more or less hereditary and transmitted by the parent to the progeny. Desirable variations are selected, perpetuated, and, as they appear, accumulated. In this way our finest breeds of stock have been improved. High cultivation is therefore necessary to maintain improved form. As there are no infallible external signs indicating milk-giving capacity, exceptions will always be met with.



5. FRONT VIEW OF "WILFUL BEAUTY," SHOWING THE DESIRED WEDGE-SHAPED FORM.

Much attention, when selecting a dairy cow, is directed to the growth of the wedge-shaped body, the improvement of the hind quarters, and the development of the udder, with all its graceful outlines and symmetrical proportions, see No. 4. This is the back view of a typical dairy cow "Wilful Beauty" owned by Mr. W. Woodmason. She was a great show yard winner, yielding up to 22 quarts of milk daily. Her show record is as follows:—

2nd Prize, Melbourne Royal, 1891.
1st Prize, Dandenong, 1891.
2nd Prize, Geelong, 1891.
1st Prize, Melbourne Royal, 1892.
2nd Prize, Melbourne Royal, 1895.

The full view of this typical dairy cow (No. 5) shows a lean, roomy frame; a distinctly wedge-shaped body, with moderately long neck; good sloping shoulders; fine wither; broad and deep chest; light fore quarters, gradually enlarging in depth and width towards the hind quarters; well sprung ribs; straight back; deep at flanks; long and broad hind quarters; thighs deep and broad; fine bone; large docile eyes; capacious, well shaped udder—broad, well up to the body and running firmly along the belly, the teats squarely set on and hanging perpendicularly.

Cows of the type and quality of "Wilful Beauty" cannot be picked up every day, and must be bred on the lines already indicated. She

is not the best dairy cow in Mr. Woodmason's dairy herd, as will be seen by looking at illustration No. 6, which shows a very fine herd of over 60 Jersey cows that any man might well be proud of—they are true to type with robust constitutions, and are good at the pail.

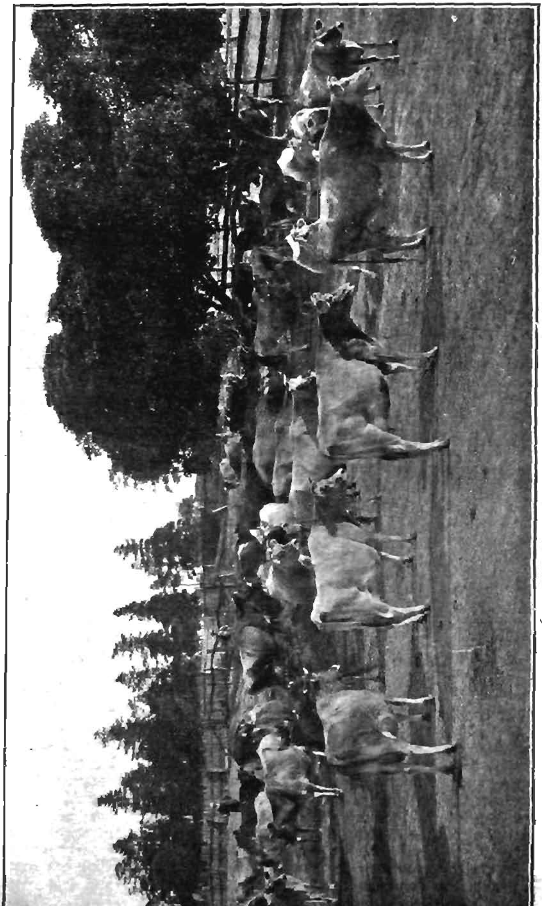
The dairymen of the Jersey and Guernsey Islands set a good example to the rest of the world in the way they guard the purity of blood in their cattle. As far back as 1789, a law was passed in Jersey, making it unlawful to import any living cattle into the island. Heavy fines were imposed on the importer, the vessel, and even the sailors who aided in such importation. It is just this jealous regard for the purity of blood in their cattle that has sent all the world to these islands for them. Contrast this wise policy with that of the Victorian dairy farmer who is not content until he can pack all known breeds into the skin of one animal, with the result that he has neither special purpose, nor dual purpose, but a no purpose cow. It simply shows what a lot we have to learn in regard to successful breeding.

Feeding.

Hand in hand with the selection and breeding of dairy cows is the question of proper feeding. Dairy cows, no matter how good they may be at the pail, if they are not fed to stimulate their productive capacity, will not produce profitable returns. The old rule of thumb practice of the average farmer in confining the cows strictly to the products of the pastures for their sustenance will have to become a thing of the past if dairying is to be carried on successfully. Hand feeding must be resorted to and preparation made to conserve abundance of succulent nutritious food for the dairy herd during the dry months by the aid of the silo. This is imperative, for with the natural pastures as the only supply of food, milking cows suffer in constitution during bad seasons. If this trying condition is continued and practised, emaciation of the body is a natural consequence. Heavy milkers under these trying conditions become seriously injured, as more digestive food will be converted into the milk at the cost of their vitality. The constitution becomes weakened, and functional derangement and disease of the organs follow, brought about by sheer starvation. The progeny is also endangered if the cow is in calf, as it is deprived of the nutriment and support which should be obtained from a well nourished mother to lay the foundation of a good constitution and a profitable milker.

Dairy farmers are often led astray regarding the result of feeding and the effect it has on the return of milk produced. A cow when freshly calved, if low in condition, will generally respond to a system of judicious feeding and care, and the quantity of her milk will increase in volume, especially if the feed she has been accustomed to is devoid of the necessary proteid constituents and moisture; this increase will, however, only continue until such time as she builds up her system and becomes properly nourished. After the cow becomes well nourished and reaches her highest attainments, there appears to be no method of feeding that will raise the standard of her milk to a still higher degree. Any food taken into the system up to this point and not utilized for the production of milk, will be used for forming fresh flesh or be excreted.

The weighing of each cow's milk and the use of the Babcock tester will enable the dairyman to discriminate between good and bad cows, those not paying their way and those being milked at a profit. There



6. A UNIFORM HERD OF PURE JERSEY COWS.
The property of Mr. W. Woodmason, Malvern.

are two kinds of cows kept in most herds, those that eat more than they make, and those that make more than they eat. "Feed for quantity and breed for quality" is a golden rule where the dairy cow is concerned. Cows cannot change the relative proportions of their milk to suit our convenience; all we can do with feed is to assist the cow to produce a large quantity of milk of her own individual proportions.

The principle of balancing the elements of food so that the cow may be best assisted to make milk and in profitable quantities, the study of environment, how to promote her health and comfort, and the treatment meted out to her, all have an important bearing on the return in milk she will produce from the feed given her. The cow to keep in the herd is one that has the ability to turn all the food she may eat and digest, over and above that required for her maintenance, toward the udder, there to be transformed into milk. The capacity of a cow for producing milk depends largely upon her capability for digesting food and assimilating it into her tissues. Dairymen who profit most by the keeping of cows soon learn to familiarize themselves with these important characteristics, and understand their relationship to capacity for production. Feeding the dairy cow for profit involves a minute study of each animal in the herd; it requires the knowledge of the amount of milk and fat each cow is capable of producing.

Dairy farming is becoming intensive rather than extensive. It is not uncommon now to hear of persons raising profitable crops from apparently poor land, while other people receive no return at all from land of similar texture. The value of the manure made from good feeding is more and more appreciated by the farmer as he uses it to renovate his depleted soil, robbed of both its humus and its nitrogen by continual cropping. This loss can be avoided by raising more fodder, keeping more stock, and thereby making more manure. Care must, however, be taken to provide a sufficiently rapid rotation of crops to insure good soil texture, and at the same time, abundance of fodder to be mixed with silage, a plentiful supply of which should always be available.

As the silo preserves the green succulent fodder throughout the year better results are obtained than when crops are converted into hay. One important reason in favour of silage is that its preparation is founded on the fact that all green fodders contain about 75 per cent. of water, and 10 per cent. of fibre. When they are dried, the water has shrunk to 20 per cent. and the fibre has increased to over 40 per cent. Much of the nutriment in the succulent state therefore becomes woody fibre in the dry prepared fodder. The blood and lean meat in the animal are mostly derived from the protein in the food eaten, and not from the carbo-hydrates, or fat, which only produce heat, energy, and fat. It is literally true that the protein does make all these substances but at too great an expense to be practically carried out. One-fourth of the solids in milk is protein and it therefore follows that the more milk a cow gives, the more protein she requires. For the silo grow plenty of maize and leguminous crops. The maize should be allowed to thoroughly mature and not cut until the grain has reached the dent stage of growth. Lucerne is still better, as 11 lbs. of it are equivalent to 8 lbs. of bran. It would pay farmers handsomely to go in for more lucerne cultivation. Peas and oats, mixed and sowed at the rate of 2 to 3 bushels to the acre, and cut when the oat heads are well formed and the peas are in bloom, make a splendid feed high in protein, and one greatly relished by the cow.

A quart of average milk weighs 2 1-5 pounds and has a specific gravity of 1.032. In making this quart of milk the cow takes the following constituents out of the feed she has eaten:—

1.18 ounces of fat.
1.18 ounces of casein or cheese matter.
1.76 ounces of milk sugar.
.35 ounces of ash.

and mixes them with 30.62 ounces of water. The ash represents all that would be left if the water were evaporated and the solids burned.

The *Year-Book of Agriculture* for 1905 gives full details of many excellent food rations adapted to Victoria. Taking 1,000 lbs. weight as the standard weight of a dairy cow, it is found that to furnish the full milking capacity the following average ration is required:—

Dry matter in food, 25 lbs.
Containing digestible protein, 2.5 lbs.
Containing digestible carbo-hydrates, 12.5 lbs.
Containing digestible fats, 5 lbs.

together with 7½ gallons of water and a little salt. The water allowance is increased during summer time. This ration is obtained in about 80 lbs. of fresh red clover, or 100 lbs. of good rich pasture grass. A full ration that can be profitably used by the average farmer consists of

10 lbs. of lucerne hay.
10 lbs. of oat straw.
20 lbs. of mangolds.
4 lbs. of oats.
4 lbs. of bran.

Dr. E. J. Russell (South-Eastern Agricultural College, England) in an able paper on The Effect of Food on Milk, recently read before The Kent and Sussex Dairy Conference and published in the *Journal of the British Dairy Farmers' Association* states the relation between the yield of milk and the quantity of food as follows:—

"The cow affords a good illustration of the universal law that the race must be preserved whatever the individual suffers. The natural object of the milk is to feed the calf, and the cow will continue to give milk even if she is starving and losing weight. When more food is supplied the animal does better herself, and also gives more milk, but the extra milk does not correspond to the extra food. A Norwegian investigator (Holtsmark) has tabulated and examined the records from 846 Norwegian dairy herds, and one of his tables is of great interest. It shows the amount of food supplied, and the amount of milk obtained. For convenience of comparison, the rations are calculated out as food units:—

No. of Food Units.	Average yield per cow for the year. lbs.	Increase in milk production per 500 food units. lbs.
1,500	2,030	—
2,000	3,133	1,103
2,500	3,988	855
3,000	4,689	701
3,500	5,280	591
4,000	5,790	510
4,500	6,240	450

The first additional 500 food units gives 1,103 lbs. of milk, subsequent additions give less and less, finally the last one only gives 450 lbs. of milk.

The first requires a little explanation. The food supplied to the cow is used for two purposes: (1) to keep the cow alive; (2) to make milk. A considerable amount is needed for the former purpose; the body temperature has to

be kept up, the heart must be worked to force blood through the blood vessels, the lungs must be worked, energy is wanted for digestion and for a variety of other purposes. All this is collectively spoken of as maintenance, and a ration which just enables all this to be done with nothing to spare is called a maintenance ration. If an animal is to lay on flesh, or to produce milk without losing flesh, it must receive more than a maintenance ration, and the greater the quantity of extra food the more there is available for flesh or milk production—up to a certain point.

Agriculture furnishes many instances of the law of Diminishing Returns, but perhaps none better than this: The vitally important point to the farmer is that up to a certain point an increase in the amount of food supplied gives a profitable increase in milk, but beyond this point the increased milk yield no longer pays for the increased food. Every man must decide for himself just where to draw the line, but there are one or two general principles which furnish valuable guidance.

"In America the maintenance ration of dry, barren cows has been determined; but in Germany experiments have been confined to bullocks, and it is supposed that the maintenance requirements of dry, barren cows, and of bullocks, are substantially correct. The standard rations commonly accepted in Germany are those given by Wolff, and subsequently modified by Lehmann :—

The Wolff-Lehmann Rations per 1,000 lbs. Live Weight.

	Dry Matter.	Oil	Protein.	Carbo-hydrates.	Nutritive Ratio.
		Digestible Nutriments in lbs.			
Maintenance only (bullock) ...	18 lbs. ...	0.1 ...	0.7 ...	8.0 ..	1 : 11.8
Cow giving 32 lbs. milk daily ...	29 lbs. ...	0.5 ...	2.5 ...	13.0 ...	1 : 5.7
Cow giving 27½ lbs. milk daily ..	32 lbs. ...	0.8 ...	3.3 ...	13.0 ...	1 : 4.5
Fattening cattle	30 lbs. .	0.5 . .	2.5 ...	15.0 ...	1 : 6.5

The American rations are somewhat lower :

	Dry Matter.	Oil	Protein.	Carbo-hydrates.	Nutritive Ratio.
		Digestible Nutriments in lbs.			
Maintenance only (dry cow) ...	12.5 lbs. ...	0.1 ..	0.6 ...	6.2 ...	1 : 10.7
Cow in full milk	24.5 lbs. ...	0.74 ...	2.15 ...	13.3 ...	1 : 6.6

"The last column, the nutritive ratio, shows the proportion of fat and carbohydrates to the protein; and it will be observed that in these rations a dairy cow is allowed more protein relatively to the fat and carbo-hydrate than a fattening animal, and much more than a store animal or a dry cow. An examination of a number of rations shows that a cow requires for milk production a diet rich in protein; highly nitrogenous substances, cotton cake, bean meal, &c., are well recognised dairy foods. The value of a set of standard rations would be that one could tell whether and to what extent a particular ration is abnormal: it is, for instance, well known that to feed to excess of protein is extremely wasteful.

"The second point is that there is a limit to the yield of milk beyond which the cow cannot go, no matter how much food is supplied to her. The limit depends on the activity of the milk glands and the power of the animal to transform into milk the food which has been digested and taken up into the body; these features are born in the animal, and their full development deneuds on proper management. You may, and should, breed them, but you cannot put them into an animal that does not possess them. Some recent experiments made at Offerton Hall, Sunderland, by Gilchrist and Bryner Jones illustrate this well. Ten cows at pasture were divided into two lots of five each, so arranged that the average yield of milk per day was practically the same in each lot. During the experiment one lot received concentrated food—a mixture of maize meal and Bombay cotton cakes, together with straw chaff—and the other received none. The effect of the yield is given below :—

Preliminary Trial—No Concentrated Food.

	Milk per cow per day.	Fat per cent.
Lot 1	30.2 pints ...	3.48
Lot 2	30.2 pints ...	3.46

First five weeks, June 19th—July 23rd, 1906.

	Concentrated food.	Daily milk yield per cow.	Per cent. of fat.	Solids not fat.
Lot 1	4 lbs.	27.3 pints	3.37	8.71
Lot 2	None	27.7 pints	3.43	8.81

Second five weeks, July 24th—August 27th, 1906.

	Concentrated food.	Daily milk yield per cow.	Per cent. of fat.	Solids not fat.
Lot 1	8 lbs.	24.5 pints	3.39	8.69
Lot 2	None	21.7 pints	3.52	8.77

"The extra food does not increase the supply of milk, and does not even check the falling off in yield as the period of lactation advances. The animals were already producing as much milk as they possibly could; and no amount of food could enable them to produce any more. From 1887 to 1900 no fewer than 2,000 cows were used for these trials; the general results showed that as regards quantity of milk produced, 10 lbs. of Danish mangolds were equivalent to 2½ lbs. of hay, or 1 lb. of either wheat, wheat offal or maize, all of which were equal, but the best results were given by cake, especially if mixed with suitable quantity of roots. Change of ration had, however, no appreciable effect on the percentage of fat or of total solids in the milk."

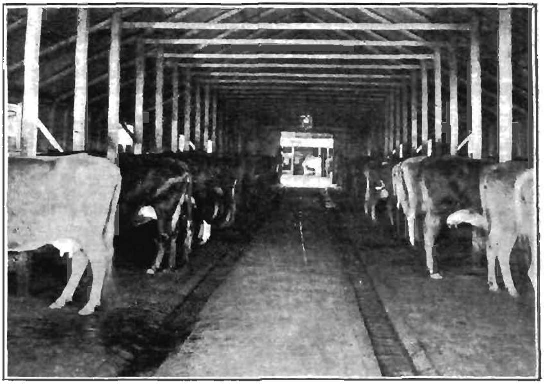
One of the dairy farms visited by the delegates at the conference referred to was that of Messrs. J. and H. Robinson, at Ilford, comprising 1,170 acres of land. The herd consists of 90 milking shorthorns and 3 pedigree shorthorn bulls. The former, which are mostly bred on the farm, include several prize winners at the Dairy Show in the inspection classes as well as in the milking trial and butter test sections. The milk of each cow is weighed once a day, and sent away for consumption in London and Brighton. The following are a few of the more recent milk records:—

Lily gave 4,551 gallons of milk in 4 years.
Robin gave 3,770 gallons of milk in 4 years.
Bluebell gave 3,103 gallons of milk in 3 years.
Leisure gave 3,629 gallons of milk in 3 years.
Flirt gave 3,102 gallons of milk in 3 years.
Duchess gave 3,272 gallons of milk in 3 years.
Fairy Duchess gave 2,792 gallons of milk in 3 years.
W. Aster gave 2,640 gallons of milk in 2 years 5 months.
Famous gave 2,184 gallons of milk in 2 years.
Hemlock gave 2,201 gallons of milk in 2 years.
Milkmaid gave 2,683 gallons of milk in 2 years.
Lady Love gave 2,089 gallons of milk in 2 years.
Diamond gave 2,083 gallons of milk in 2 years.
Kestral gave 2,133 gallons of milk in 2 years.
Day Dream gave 2,146 gallons of milk in 2 years.
Hawthorne gave 2,016 gallons of milk in 2 years.
Queen Mab gave 2,156 gallons of milk in 2 years.
Bertha Crawford gave 1,060 gallons of milk in 2 years.
Ilford Garland gave 1,187 gallons of milk in 11 months, with first calf.
Sweetheart gave 1,169 gallons of milk in 11 months, with first calf.
Ilford Almond gave 973 gallons of milk in 11 months, with first calf.
Prima Donna gave 829 gallons of milk in 11 months, with first calf.

The above records were taken from consecutive years' milking in each case. The admirable dairy character of the herd has been brought about, and is being not only sustained but further developed by judicious selections of heavy milking cows possessing udders of good shape, and crossing them with pedigree bulls of proved milking strains. Although most of the cows have been bred on the farm, for several years past the herd has been strengthened by the purchase of exceptionally good milkers from some of the best pedigree Shorthorn breeders.

SHELTER.

The shelter and milking shed should be arranged with a view to cleanliness, perfect drainage, abundance of light and air, and comfort of the cows (see illustration No. 7). It is of the utmost importance that proper shelter should be provided for the dairy herd whilst being fed and milked. Warmth economises food, a matter of great importance at all times, but especially when food stuffs are dear. Experience has incontestably proved that animals exposed to the cold without a proper warm shelter shed, require much more feed to maintain them in a thriving condition than others provided with shelter and warmth. The milk producing capacity may be reduced quite 50 per cent. during the milking season owing to neglect to provide suitable shelter for the cows during the cold winter months.



7. A SANITARY MILKING AND SHELTER SHED.

A great many farmers seem to regard any outlay for needed improvements on the farm with decided aversion. Yet in every case when ordinary good judgment is used the farm is much the safest investment, and will pay the handsomest rate of interest in return. A good cow is severely taxed by conditions imposed upon her by nature to supply milk, but in addition to this, subject her (as is the practice on many dairy farms) to all kinds of impositions, such as bad feed, the full force of the summer heat, and cold blast of winter weather without shelter and protection, and what can you expect? Under these conditions is it any wonder that cows do not give profitable yields? If possessed of a good herd of cows, you should see to it that your cows are so well protected, fed and sheltered that little is required of them but to yield milk, and not be asked to wear themselves out in the matter of self protection.

POINTS OF THE DAIRY COW.

HEAD.—A good milch cow of almost any breed should have a long lean and rather small head (a large headed cow will seldom fatten or

give much milk); broad forehead and great width between the eyes, the forehead being slightly dished. The latter characteristic is an indication of intelligence and adaptability to learn quickly—animals of this type are appreciative of kindness shown to them; full headed cows, and cows with Roman noses, are mostly aggressive and wild to handle. The head should be carried at a pose, slightly higher than the level of the wither. Cows that carry their heads low are generally of a restive and stubborn disposition; on the other hand when carried too high it is a pretty sure sign of nervousness.

The eye should be large, bright, and docile, yet with a peculiar placidness and quietness of expression. A cow with such an eye can generally be relied upon to have a good disposition. She does not become excited and rush about on the first indication of anything unusual happening about the milking yard; she takes things quietly and leisurely, which is conducive to a full and persistent flow of milk. Slow movement of the ears and body can also be taken as an indication of tractability and slowness to be roused. On the other hand, cows with eyes too large and open are generally found to be excitable and of a nervous disposition and the same may be expected of the quick flashing eyes.

Too little significance is often placed upon the absolute importance of the disposition of the cow to be purchased and it often happens that although she may be possessed of all the outward essential points required, this necessary qualification is lacking and she is found to be restive, emotional, and excitable and a bad doer. The lining of the ear, the skin surrounding the udder, inside the thighs, around the eyes, and at the root of the tail should be distinctly golden or deep yellow in colour.

The muzzle should be broad; a large feeder is usually possessed of strong organs of mastication.

BODY.—The shoulder should be lean, razor-like and slanting in appearance. While the heavy milker is light and narrow through the shoulder, immediately at the back of it there should be a quick broadening out in the region of the heart, so as to give free and ample room for expansion of heart and lungs. The large roomy chest and barrel disclose the capacity for healthy action of heart and lungs and digesting large quantities of food. The neck should be fine, slim, and clean; deep and thickening towards the shoulder, with well cut up throat. The absence of thickening around the neck and heaviness in the fore quarters, gives a feminine appearance to the animal, and points to the development of maternal instincts.

The legs should be short, straight and fine, because the leggy animal very often spends too much time and energy in travelling about and jumping fences. Fineness of bone is also an indication of femininity and economy of production.

The skin should be mellow and elastic to the touch. The soft skin, its fineness and pliant nature, are indications of a healthy secretion. Coarse hair suggests ill-breeding and absence of high milking qualities; the skin should be yellow, loose, of medium thickness, with a yellow secretion.

The body should be deep from the middle of the spinal column to the navel, with great breadth of body through the middle from side to side. Cows that are so shaped are capable of storing large quantities of food. The ribs should be broad and well sprung and the stomach large and roomy. The backbone should be strong and rugged,

indicating that it encloses a large, strong spinal cord. Nerves branch off from this cord between each of the sections of the backbone and the larger these nerves, the more open are the sections, and further apart the ribs. This gives the dairy cow the appearance of being long-bodied, and of having a relaxed appearance. The ribs should spread out widely so as to give the carcass as globular a form as possible and to show the essential growth of the wedge-shaped body. The general lean appearance of the profitable dairy cow indicates that the whole organization, with its nerve force and digestive capacity, is engaged in rapidly converting all foods eaten into milk.

The thighs should be somewhat thin, with a slight tendency to crookedness. The high and arched flank is a characteristic of the good milker, as is the low and straight flank of the beef cow. The loin should be broad and strong, with hips wide apart, the back bone rising quite high between them, indicating plenty of room for the organs of maternity—a prominent spine, ending in a distinct pelvic arch, is evidence of strong nerve force and a roomy chamber for the womb. The tail should be thick at the upper part, tapering to a fine point and should reach over the hock like a plumb line; the more it tapers the more it denotes good breeding.

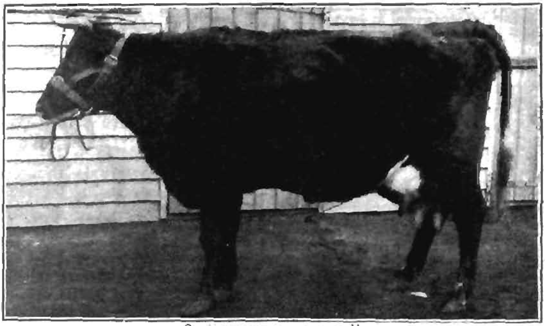
UDDER.—This should be of sufficient size to contain a good supply of milk; but not too fleshy. The skin should be thin and free from lumps, and coarse hair. The teats should be of moderate size, at equal distance from one another and nearly the same size from the udder as towards the point—a funnel-shaped teat is decidedly objectionable and is an indication of a tough milker. A cow that is a heavy milker must necessarily develop a large udder. If free from fleshiness, and other deformities, the size of the udder is one of the most reliable indications of efficiency in a dairy cow. As the milk-giving organs can be considered only with reference to their feel and external appearance, and as the bulk of the udder is often only a mass of bulky tissue, the yield of milk will often be very deceptive in proportion to the size of the udder. Frequently, two cows with apparently the same sized udders from outward appearance will, when milked, show a very great contrast in results obtained, the difference being caused by the greater or less diversity of the tissue of which they are composed. It is therefore obvious that success depends upon the productive capacity of the individual cow, rather than upon any particular breed, inasmuch as there are such wide variations in different cows of the same breed in regard to the amount and quality of the milk they produce.

It is not always an easy matter to judge a good dairy cow from the shape and size of the udder, or from the conformation and external appearance. The only reliable way to arrive at the true merits of any dairy cow is to estimate her value by the use of the Babcock tester and by keeping an accurate record of the number of pounds of milk she gives. This alone will not be a guarantee that you have been fortunate in selecting a good cow as the important questions arise, "How long has the cow the power to continue the flow of milk during the period of lactation?" "Whether she has a strong constitution?" as these indicate the power of reproducing calves equal or better than herself. These factors—apart from the records of regular milk yields per day, or the actual pounds of butter fat produced—must be determined by the practical experience of the buyer in selecting a dairy cow by external conformation only. It is not an uncommon experience to find large

producers of milk with only moderately sized udders, and for small producers of milk to have large udders. The development is generally proportioned to the milking capacity of the cow. The up-to-date knowledge of the functions of the udder is that it is not a mere sack in which the milk is stored until drawn at milking time, but that it is a milk maker that operates while she is being milked; the milk-making functions being stimulated by agitation from the process of milking. If the cow is not contented during the milking period the agitation will not have the desired effect of producing milk in liberal quantities. Hence the necessity of quiet and careful handling.

ESCUTCHEON.—F. Guenon, a leading authority on escutcheons, states—

"During the many years which have passed since I gave to the public the *first edition of my "Treatise on Milch Cows" men of science and practical breeders* have given it great attention. The surface of the escutcheon is distinguished by its upward-growing hair, which takes a direction opposite to that which covers the other parts of the skin. The hair of the escutcheon is also distinguished by its tint, which is duller than that of the other hairs. The escutcheon starts from the middle of the four teats, a part of its hair extending forward under the belly, in the direction of the navel, while the other part, beginning a little above the hocks, *spreads as far as the middle of the hinder surface of the thighs, ascending on the* udder; and in some cases running up as high as the top of the vulva. The fineness of the hair of the escutcheon, and the colour of its skin, indicate the quantity and quality of the milk. Cows which have the skin of the escutcheon sleek, white, and covered with long, spare hairs, will give a thin, serous milk; while those whose udder is covered with an escutcheon of short furry hair, will give good and rich milk. The indications of the escutcheon are often modified, favorable or unfavorable, by *various feathers which are pretty generally met with, whose value* may be judged by their form, their character, their situation, and their size."

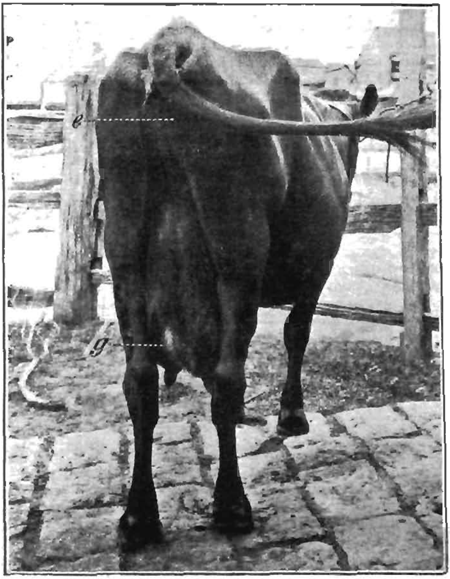


8. "BELLE OF COLAC."

Bred by the late Hon. J. H. Connor, M.L.C., and winner of Lord Brassey's *Gold Medal for the best cow in the Butter Test Competition at Geelong Agricultural* Show.

Except the oval feathers as shown in the escutcheon in the illustration, on page 467, all those which encroach upon the escutcheon, lessen, in greater or less degree, its favorable indications. Guenon places this particular feather in the second order, and says cows of this order in full milking will give 21 quarts of milk a day, and will continue this quantity until they are seven months gone with calf. The marks of

this order perfectly coincide with those of the first order cows; and I have indicated them by the same letters. They have besides a little feather of descending hair, which is called the "Babine Feather," placed below and to one side of the vulva, or often on both sides at once. This feather is indicated by the letter f. It measures about 2.4 inches in length, by about 0.4 inches in breadth. It is distinguished by very short hair, and indicates an inferiority in the daily milking amounting to two or even three quarts. This order has but a single oval feather above the teats, measuring 2.4 inches in length, by 1.2 inches in breadth, and shown by letter g.



9. A GOOD ESCUTCHEON, SHOWING OVAL FEATHERS INDICATING GOOD MILKING QUALITIES.

I have been examining cow's escutcheons in all the dairy herds inspected by me during some months past and the particular cow illustrated (No. 9) shows the best escutcheon seen so far. The owner informed me that she was one of the best cows he has owned and she milks precisely as described by Guenon. My late father, who was acknowledged to be one of the best judges throughout the State, and who for many years was a constant winner in the milking test competitions of dairy cows at

the Melbourne, Geelong, Ballarat and Colac shows with cows of his own breeding, always paid great attention to the escutcheons of the cows and bulls used in the dairy herd. The colour of the skin (yellowish) and the little scales that can be scratched from the end of the tail and inside the ear, were always a reliable sign of a rich milker.

Milk veins, which show on the udder and on each side of the body forward of the udder, should be well developed, prominent and well formed, so as to allow a free circulation of blood from the heart to the udder. They do not contain milk, as some are inclined to think. Length of milk veins denotes dairy heredity, and there are very few heavy milkers and great performers at the pail that do not show prominent veins. A big flow of milk calls for a large flow of blood to and from the udder, and the large development of the udder necessarily involves a large blood supply, the blood being made from the food consumed by the cow, hence the size and tortuous appearance of the milk veins in a heavy milker as shown in illustration No. 8.

TEMPERAMENT.

Temperament in a dairy cow is one of the main points upon which her adaptability for dairy purposes depends. It has to do with the balance between the forces of the nervous and the vital systems and is largely a matter, as previously mentioned, of heredity, modified somewhat by environment. Contented cows respond more readily to kind treatment, which has its effect on the flow of milk. A nervous disposition interferes with the production of milk; the blood supply is diverted from the milk glands to some other part of the animal's system, and without a proper amount of blood, the milk glands cannot be asked to do their work satisfactorily. What is commonly known as not "giving down" or "holding up" the milk is the result of a lack of nerve tone in the gland, caused by some undue excitement. Milk production with cows is the result of nervous force, and this nervous force starts from the brain and runs along the spinal cord.

GENERAL CONCLUSIONS.

In summarising the principal features of distinction in a good milch cow, we are largely guided by the functions on which depends her commercial value. In contrast with beef cattle one should pay strict attention to milk production. This is controlled to a greater or less degree by the capacity and vigorous condition of the digestive system, the nerve force required to stimulate and assist digestion and the circulatory apparatus, finishing up with the facilities and conditions provided for milk secretion as evidenced in a capacious udder. The various breeds, their crosses and grades, all provide excellent milkers, and it is to the general elevation and improvement of the dairy cow as a milker, that the efforts of all progressive dairymen are mainly directed. The climatic conditions and the great diversity of grazing areas existing in different parts of the State vary to such an extent, that it is hardly practicable to absolutely determine a standard of dairy cow for all purposes. At the same time when one reads what is taking place with regard to the improvement of the dairy cows in other parts of the world, it is evident we in Victoria, with all our natural advantages, are very much behind the times.

FRUIT TREE STOCKS.

C. T. Cole, Inspector, Vegetation Diseases Acts.

What the foundation is to a house, the stock is to a fruit tree, and if trees are worked on unsuitable stocks disappointment will result, the tree will cease to be healthy and vigorous, and ultimately die or become useless.

APPLE.—In Australia, we have made quite a new departure with regard to apple stocks. In the old country the seedling apple, or more commonly termed the crab stock, is the one used by nurserymen and orchardists, except in the case of dwarf apple trees, when the "Paradise" stock is used. Here, however, it was found, after some years of experience, that the crab stock was so subject to the woolly aphis (*Schizoneura Lanigera*) that it was almost impossible to cultivate apples at all; in fact apple culture was nearly at a standstill when the two now so well known blight-proof varieties, "Winter Majetin" and "Northern Spy" were introduced as stocks. After a certain amount of prejudice was overcome, growers on all hands recognised this discovery as a boon, and cultivators adopted it freely. The "Northern Spy" has proved better adapted as a stock than the "Winter Majetin" and is now almost exclusively used.

There are several other blight-proof kinds of apples which could doubtless be used as stocks, but there is no need to increase the number except for special purposes. Among thoughtful cultivators the question suggests itself—Is it desirable to keep to one stock only, and propagate by layers, roots, or grafting of roots? I think it is, and to prevent the stock from becoming weaker in its constitution, from constantly working and re-working upon the same variety, I have worked "Majetin" on "Spy," and "Maggs Seedling" (another blight-proof kind, and robust in constitution) upon the "Spy," with the best results.

For dwarf-apple culture the "Spy" can be used, and the "French Paradise" worked upon the "Spy," and the desired kind again worked upon the "French Paradise." This, however, becomes tedious. We have now in this State, raised from seed here, a "Paradise" apple tree of dwarfing habit—free surface rooting properties very easily propagated, and upon which the desired kinds may be worked direct. All kinds appear to thrive admirably upon it, and it is quite blight-proof.

It may be mentioned that even now there are localities where the old Crab stock or seedling apple can be used with safety, viz., well drained, deep sandy soils; but such stocks are now so scarce that it would be difficult to obtain any from nurserymen. The blight-proof stock is now almost exclusively used.

Planters must take great care that their trees are worked sufficiently above the surface of the ground to prevent the scion from striking roots into the ground, and displacing the blight-proof stock, thus rendering the whole tree roots a blighted mass.

APRICOT.—This is, perhaps, the most difficult to deal with in regard to stocks. Great dissatisfaction has been experienced by growers in consequence of their trees breaking off at the point of union with the stock while in perfect health; and in other cases by the trees having a stunted growth and sickly appearance. This is generally due to unsuitable stocks.

The plum stock now generally used is a variety of the "Myrobolan" called "La France," which is easily propagated from cuttings and does not

sucker, but such varieties as the "Montgamet" and "Large Early" type, when worked upon the above stocks are very apt to blow off at the union of the tree with the stock when fully grown. I much prefer the common "Mussel" plum as a stock, as it succeeds well in most soils and climates, and the most popular market sorts do well upon it. The advantage of the plum stock over the seedling apricot is that it will adapt itself to almost any soil, whereas the seedling apricot is only suitable where the soil is light and warm, or well drained, the climate warm, and the rainfall not excessive. The seedling apricot is much sought after by planters in the warmer and drier districts of the State, and in many cases it does well. It stands much drought, and will grow when many other trees are at a standstill. It is, however, apt to grow too vigorously at the expense of the size and quantity of fruit, whereas the plum stock, which has a more dwarfing tendency, grows finer fruit as a rule. As in most fruits, the theory that if fine fruit is wanted the stock must not be too vigorous holds good with this as with most fruits. It is much better for a scion to somewhat overgrow the stock than for the stock to grow faster than the scion, or upper part of the tree. In the one case, well-developed fruit and heavy crops are the result, while, in the other, thin crops and poor fruit are the rule. The nourishment which should go to the fruit expends itself in wood and leaf—the cherry is a striking example of this. Some growers work the apricot upon the almond—a most unsuitable stock. Never plant trees upon this stock. The peach is a most desirable stock in localities where the plum does not do so well as the peach.

PEACH.—The peach stock raised from the stone is, doubtless, under almost all circumstances, the best stock for the peach. Some difficulty is often experienced in getting the stones to germinate: some seasons they come up freely and in others very few grow. The stones from one season's crop of fruit will grow freely, while those from another season's crop will nearly all fail. Stones saved from medium sized mid-season's varieties are generally the best for planting. The stones, immediately they are collected, should be placed in the ground in a well sheltered position, and covered over with sand and allowed to remain there until planting time. When once the stock is above ground it is easily managed; it roots very freely, throws plenty of fibres, and a tap root which is easily managed, and does not require to be removed from the seed bed till the young tree is ready for transplanting to its permanent position. If the stones are planted in too rich soil, then a strong tap root is formed at the expense of fibrous roots; in such cases the tree should be removed when young. If possible, always bud the stocks the same season as they come up.

There are localities where the almond stock is preferred to the peach—not only preferred, but becomes necessary, as the peach refuses to grow and succeed on its own roots. In such districts as Swan Hill and south of Melbourne growers will, on no account, plant peaches upon any other stock than the almond. The effect produced upon the growth of the peach tree in these districts (when upon the peach) is remarkable. The tree assumes a thick bushy habit of growth, throwing out innumerable useless lateral shoots with no bearing wood. The tree remains a thick bushy shrub, while those on the almond produce quite a different growth—fruitful shoots are made, covered with well-developed fruit buds. The leaves are of a paler green than upon the peach, and none of that useless unfruitful spray is made, and the result is good crops of fine well-coloured fruit.

Plum.—Several kinds of stocks are used for plum trees, viz., the "Julien" seedling plum stock, cherry plum "La France" (a variety of "Myrabolan") and the "Mussel" plum stock. During a long experience I have found no better stock than the last named, if judiciously selected. The "La France" stock is now used by nurserymen. It will not stand excessive moisture, or thrive in badly drained grounds, and often in orchards when the trees are fully developed and in bearing, trees will suddenly die completely out in one season, especially such as the "Yellow Magnum Bonum" and that type of plum.

Sometimes seedlings are recommended, chiefly, it is maintained, because such do not sucker. This is quite a mistake. I tried the experiment several years ago, and found that those trees worked upon seedlings threw up many more suckers than those worked upon the ordinary sucker stock. It has been found that in many localities the "Cherry" plum has proved a good stock, causing robust growth and being in all respects desirable. All kinds, however, will not succeed upon it. The "Diamond" plum, and others of similar type, the "Orlean" and some others, succeed well upon it. Experience must decide as to which kinds are best adapted for the "La France" and "Cherry" plum in the particular districts in which they are grown. The two varieties mentioned are the only stocks which do not throw suckers, and for this reason are desirable to use when suitable soil and locality to be grown in.

Cherry.—Experience has shown that the stock in general use for the cherry in the old country is not adapted for these States. There, the seedling "*Mazard*" or *wild black cherry*, is used as a stock for orchard planting and the "Cerasus Mahaleb" or perfumed cherry, where dwarfing is required. Neither of these stocks is of any use here. Some few years ago there was a great demand for the seedling cherry stock, which, as a stock, is almost identical with the "Mazard," especially when raised from black cherries. At the period referred to, it was claimed for this stock that it had a hardy constitution, would attain a large size, and not throw up suckers like the stock generally in use. But, as predicted at the time, its popularity was but short-lived. It was found that the varieties worked upon this seedling stock grew splendidly for a few years, and had the appearance of making large well-developed trees; but the vigour soon ceased, and the trees began to die off, and those in more favoured spots that did not die bore but scanty crops of fruit of small size and inferior quality.

The "Mahaleb" cherry of English shrubberies is much used in Britain and on the Continent as a dwarfing stock. Why cultivators should have selected this stock is a matter of surprise, as with us its dwarfing capabilities are not manifest. It rather induces a vigorous growth for awhile, and then the trees die out; this happens when the "Duke" and "Kentish" classes of cherries are worked upon it and they are the classes specially recommended for this stock. The old cherry stock in use from the foundation of Victoria and now in general use, is the best stock known here. It is, as all growers know, a small red cherry, ripe just before Christmas; it is a good cooking variety, and pleasant to eat. It is one of the "Montmorency" section, much like a "Kentish." It is, however, not faultless; it throws up abundance of suckers, and for this reason is somewhat troublesome; still I believe it is the best stock for cherries. It is not generally known or recognised that the fact of this stock not keeping pace with the kinds worked upon it is its great virtue. It acts upon the

scion as the quince does upon the pear and the "Paradise" upon the apple. It is because the scion overgrows the stock that the tree becomes so fertile and its fruits so fine; in fact, it is a dwarfing stock. This stock, as far as my experience goes, is adapted for every variety of cherry.

PEAR.—As with the peach, so with the pear; the stock most generally adapted for the pear is the seedling pear stock, raised from the hardiest known kinds, which, as a rule, seed very freely and produce good stocks. As is usually the case with most fruits, the finer kinds do not produce much seed, and stocks raised from such are not generally robust. But where one seed is saved from pears of delicate constitution, hundreds are saved from hardy kinds, so that, generally speaking, hardy stocks are used.

I would advise that pear suckers never be used; if they are they will prove a great disappointment. In the early days, when seedlings were scarce, resort was had to suckers, and, as a matter of course, it was only from trees that suckered abundantly that any quantity was obtained. Trees from these were planted out, and the results were disastrous. Not only were thousands of useless suckers thrown up, but the trees refused to bear, though the same kinds on the seedling pear bore regularly and heavily. The trees on suckers had to be rooted up as entirely worthless. As a rule, and in most localities, the seedling pear stock is the most desirable for pears.

There is also a variety of quince, a kind of small "Angers," which is used most successfully, and upon which some kinds do well, even when worked directly upon it. As there are but very few kinds of pears that do well when worked directly upon this quince, it is usually necessary to double work on the stock. First of all, work such kinds as "Beurré d'Amanalis," "Louise Bonne of Jersey," or "Beurré Diel," upon the quince; allow them to make yearling shoots, and then work upon these the desired sort, when perfect health and vigour will be attained. This mode of culture is most interesting and profitable, especially in the cooler districts of the State, where the pear-on-the-pear takes so long to come into bearing. On this quince stock fertility is attained very quickly; the trees grow comparatively slow, but fine fruit and quick returns are the results. This mode of culture wants to be better known, when it will be largely adopted in the climates referred to.

There are other stocks used for pears, such as the "Hawthorn" and "Mountain Ash," but these are not necessary or desirable where the proper kind of quince is obtainable. It has been affirmed that the pear-on-the-quince is but short-lived; this is not the case. In France there are trees of great age, where this system of culture is largely practised with most satisfactory results; likewise in various parts of Victoria, where they have been planted for many years, they will be found bearing heavy crops of good fruit each season.

FOURTH PROGRESS REPORT ON VITICULTURE IN EUROPE.

(*Continued from page* 430.)

F. de Castella, Government Viticulturist.

Reconstitution in Spain (*continued*).

The Malaga District (*continued*).

STOCKS USED IN THE MALAGA DISTRICT.

When phylloxera was discovered near Malaga in 1878, reconstitution in France had entered on what may be termed the "Riparia stage." The stocks first used, such as Taylor, Yorks Madeira, Jacquez, &c., were being superseded by selections from among the Wild Riparias imported from America. Chief among these were Riparia Gloire de Montpellier or Portalis and Riparia Grand Glabre, both of which are known to us in Australia. These enjoyed an extraordinary popularity and served as stocks for over 80 per cent. of the replantations then in progress. Spanish growers, who turned to France for information and advice, followed the French lead, and in their reconstitution adopted the Riparia to the exclusion of all other stocks. So much so, that even at the present day the word Riparia is generally employed in many parts of the south of Spain to denote an American vine.

Phylloxera first appeared in the wine producing region known as the Montes de Malaga, and it was here that reconstitution was commenced. Wine became scarce and its value increased. Led on by hopes of very remunerative returns, speculators bought up large areas of dead or dying vineyards and hurriedly replanted them, using as stocks the Riparias which were then the fashion in France. Most planters imported their cuttings direct; others, however, raised large quantities of seedlings—a most injudicious course in view of the great variability always existing among seedling vines.

The neglect of subsoiling has already been referred to. The American stocks were planted in the same way that was the rule with old viniferas in pre-phylloxera days. Results were most disappointing. Under such circumstances even the most drought resistant American vines could not have given profitable results. The use of Riparia as a stock aggravated the trouble and contributed, perhaps, more than any of the other factors mentioned to make reconstitution in the Montes de Malaga a complete failure. Nor was failure immediately realized. At this period the great dread of French growers was chlorosis, so common in limestone soils. Malaga vignerons found consolation in the healthy green colour of their vines in these stony soils free from lime. They hoped in vain that vigour would come with age, and continued to struggle along with deficient vegetation and miserable yields until repeated losses compelled them to abandon the cultivation of their vineyards.

This failure of the Riparia stock is an interesting object lesson and one which should serve as a warning to growers in hot districts and dry situations. It caused the extinction of a once prosperous wine industry, the ruin of the pioneers long deterring others from risking a like fate so that at the present time this region is mostly bare of vineyards. The

few small growers who have replanted of recent years employ such stocks as Rupestris du Lot and A.R.G.I. and appear to be getting fairly satisfactory results. Taken as a whole the wine growing portion of the Malaga district presents a melancholy and disappointing picture in which the failure due to the use of the Riparia stock in dry situations and in insufficiently prepared soil, stands out as the most striking feature.

STOCKS FOR RAISIN VINES.

I have already referred to the difficulty in finding a satisfactory stock for the Muscat of Alexandria (First Progress Report). In France it is admitted on all sides to be what is known as a very bad scion. If not absolutely identical with it, the Gordo Blanco is, to say the least, very closely related to it and seeing the poor affinity existing between the Muscat of Alexandria and most American vines I looked forward with great interest to the opportunity of gaining information as to the best stocks for the Gordo Blanco or Malaga Moscatel in a district where it is so largely cultivated. Though growers generally admit it to be a bad scion, the evidence I was able to collect as to the best stocks for it is less definite than I could have wished, and on the whole rather unsatisfactory. The question does not seem to have been studied, by means of experimental plots, so thoroughly as its importance merits. The present position seems to be that, though the most progressive growers hope that some of the more recently introduced stocks will prove to be completely satisfactory, many of them continue to plant and graft with Moscatel, stocks for which they admit it to have imperfect affinity.

I was greatly astonished to find that Riparia is still fairly extensively used, the variety most favoured being a local selection from among the seedlings of this species, so extensively raised in the early days of Malaga reconstitution. Early fruiting and early ripening are two of the chief advantages of Riparias. The latter, especially, renders it popular with raisin growers as it enables the fruit to be gathered whilst the weather is still warm enough to dry the grapes conveniently. Two circumstances mitigate to a considerable extent the faulty affinity existing between Moscatel and Riparia. In the first place, the soils of the Vega, where it is planted are deep, free and rich—typical Riparia soils in fact—where this species might be expected to thrive. In the second, the exceedingly short pruning practised, has the effect of preventing much of the evil influence of want of affinity.

It will be remembered, that in Southern France it was chiefly when pruned too generously that vines grafted on Riparia declined after a few years of satisfactory yields. Exceedingly short pruning for a year or two gives the vines a rest and seems to bring about a return to normal conditions. Worn out and enfeebled vines may often be rejuvenated and brought back to health in this way. The exceedingly short pruning of the Malaga district is probably the chief factor which renders possible the use of a stock possessing such unsatisfactory affinity for the scion to be grafted on it. With our wide planting such short pruning would be out of the question as yields would be too small. The use of an equally early but more durable stock even for Malaga is much desired. As one grower explained, "The Riparia is satisfactory so long as one is prepared to replant 10 per cent. of one's vineyard each year." He usually replaced his defective vines with ones grafted on 1202 with the result that the vineyard was far from even in composition. This defect was noticeable in several of the vineyards I visited.

Other stocks which possess the advantages of Riparia without its drawbacks are now being largely used—Vitis Berlandieri and its hybrids for example. This species, like Riparia, promotes early ripening. In addition, it possesses the precious quality of serving as a good stock for several troublesome scions. Pure Berlandieris have considerable affinity, and seem to make satisfactory stocks for the Gordo though their difficult propagation has prevented their use on a large scale. Berlandieri hybrids appear to have much to recommend them and Nos. 41B, 420A, 157-11, and 161-49 are coming into extensive use as raisin stocks, the first mentioned being the most popular. Some young Gordos I saw grafted on 41B at Don Leopoldo de Salas y Amat's vineyard at Paredones were doing very well and seemed to augur well for permanent success. Several other Vinifera-American hybrids are also coming into more general favour, the vinifera relationship increasing affinity as it usually does in the case of bad scions; 1202 is largely used and always well spoken of. It is one of the favorite stocks. A.R.G.I., strange to say, is not nearly so satisfactory. Grafted with Gordo it is very prone to throw suckers and the union often fails after a few years. One grower found suckers less troublesome in the case of bench grafts, the eyes of the stock of which had been cut out. Another informed me that summer bud grafting (Yema), gave a more durable union than the usual spring method. On the whole, A.R.G.I. does not seem recommendable as a Gordo stock.

VIGNERONS LIFTING "BARBADOS" OF 41B.

Rupestris du Lot, though well spoken of by some, is not playing a large part in recent plantations. Rupestris Martin was a good deal used at first but is now being abandoned. Another Rupestris which has some partisans is R. Giraud. It is said to be better than Lot in richer soils in which the latter sets its fruit badly.

No. 106-8 (Riparia x Cordifolia Rupestris) has been successfully tried in some stiff clays but the majority of Malaga soils contain too much lime for it.

None of the Riparia-Rupestris hybrids are much used though they are said to form good unions with the Moscatel. One grower complained of the grapes dropping off vines grafted on 101-14.

Among the newer stocks one finds 4-3 and 2-9 Salas which I have already briefly referred to. Their raiser expects very good results from

them but they have not yet been thoroughly proved. Two other Vinifera-Americans occasionally used are Bourrisquou x Rupestris, No. 601 of Couderc, good for clay soils but not easy to graft, and Colomb and Rupestris, chiefly used in clay soils rich in lime.

As far as it was possible to gather during my brief visit, the most promising stocks for Gordo Blanco appear to be 41B and 1202 as well as several other less extensively tried Vinifera-American and Berlandieri hybrids. The two former are the kinds for which the demand is most active at the present time. The illustration shows vignerons lifting *Barbados* (ingrafted rootlings) of 41B.

DRYING METHODS.

As has been already stated, Malaga raisins are not dipped in any way. They are simply sun dried; the natural bloom of the grapes is one of the most valuable characteristics of high grade dessert raisins and this would be destroyed by dipping. The other two principal qualities are a blue black colour, as it is called in the trade, which shows the bloom to advantage, and a thin skin; the former is secured by heavy manuring of the vines and the latter by protection from the sun's rays before ripening, by a good canopy of vine leaves.

The grapes are carefully picked as soon as maturity is complete, but before they are over ripe they are conveyed in shallow baskets, on men's heads, to the drying grounds or *Toldos*. These are of two types; the older style consists of inclined planes of hard dry earth covered with coarse sand and gravel on which the grapes are laid to dry. The illustrations give an idea of the construction of these toldos. The retaining walls are of brick, the slope of the floor being about one in eight; each compartment is about 6 x 40 feet. They always face south so that full advantage may be taken of the sun's heat. The gravel is fine and water-worn and reminds one of that on many a garden path. On this the grapes are laid. During the night they are covered with boards to protect the fruit from dew. The retaining walls which are a few inches higher than the gravelled surface prevent them from touching the fruit.

Some toldos are somewhat different from these and consist of slightly raised but level beds similar to those in a vegetable garden. The surface is beaten hard and covered with gravel in the same way as the inclined ones. At each end of the horizontal beds is a triangular support to which a ridge pole can be fixed. Over this a tent is placed at night and secured by pegs driven into the ground. This serves in the same way as the boards on the inclined toldos as protection against dew.

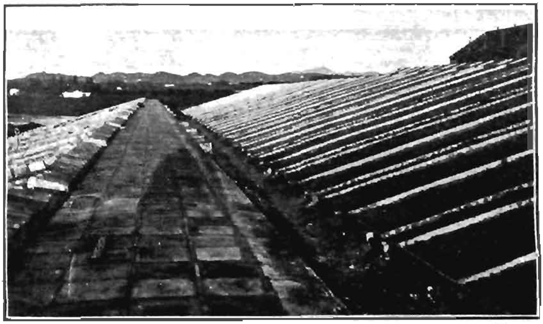
Drying and packing constitute two distinct branches of the raisin business; the former is carried out by the growers. The less the grapes are handled before being dried, the better the appearance of the resulting raisins—the bloom on the outside of the berries must be preserved as much as possible. The bunches are laid carefully on the gravelled floor of the toldo on which they are fairly closely packed in a single layer. They take about three weeks to dry, the time varying with the state of the weather. During the progress of drying they receive one or two turnings carefully executed by hand, the intervals between each compartment of the toldo permitting the passage of the men charged with this work. The exact stages at which these turnings are carried out are of importance, as they seem to have a good deal of influence on the texture

and quality of the resulting fruit. As a rule it takes 3 lbs. of fresh grapes to make 1 lb. of finished raisins.

The packing of dessert raisins is a most important matter, the get up of the fruit having a considerable influence on its market value. Packers go to great pains to place the raisins before consumers in the most attrac-

DISTANT VIEW OF "TOLDO" FOR RAISIN DRYING.

tive form possible. Even the cheaper grades are very neatly got up, whilst the extravagant embellishment of the choicest sorts is really surprising, gaudy coloured prints and stamped or embossed paper frillings being lavishly used.



VIEW SHOWING ARRANGEMENT OF DRYING BEDS IN "TOLDO."

Packing is carried out in factories to which the fruit is carefully conveyed from the drying grounds. Packing is quite an art and is done by expert tradesmen who are paid by contract and not by the day. Grading is a most important point and it receives careful attention. The raisins are roughly graded when they are removed from the toldos. They are again carefully graded before being packed. At one factory I

visited, the raisins were being put up in cartons each of which contained 1 lb. of fruit—the packer received 1 peseta (about 10d.) per case of 20 cartons. He was able to properly pack from 2 to 3 cases per day. This will give an idea of the wages ruling. The grapes were weighed out to the packer in 1 lb. lots and he had to place them in the cartons so as to show them to best advantage. The size and shape of the packages vary considerably, many different sorts being used. Raisins for one country are quite differently packed to those intended for another.

The difference between French and English packing is very striking. For the French market, the bunches are kept entire, and so placed that on opening the box the different bunches can usually be distinguished from one another. They are pretty loosely packed, especially in the case of the choicer grades, where each bunch is often ornamented with a knot of bright coloured ribbon tied round its stalk. For the English market the packing is tighter. The top layer is finished off by means of a number of extra large berries carefully flattened out or moulded between the finger and thumb of the packer. When opened, the case presents an even appearance, no stalks being visible, and one is struck by the size of the surface berries which are finer than those in the lower layers of the case. With French packing there is no difference in quality between the upper and lower layers, whilst with English packing the difference is considerable. French cases are as a rule larger—a favorite size being one containing 22 lbs. of fruit arranged in four superposed paper trays. Cases containing one-half and one-fourth respectively of this quantity are also used.

The trade names given to the different grades for each country differ a good deal. The French trade names are based on the original Spanish ones with which they correspond as the following list will show. The different grades are in descending order of quality:—

	Spanish terms.	French terms.	English terms.
Bunches.	Imperial	Imperiaux Extra	Extra Imperial Clusters, 7 cr.
	Imperial Bajo	Imperiaux	Imperial Clusters ... 5 cr.
	Royau	Royaux Extra	
	Royau Bajo	Royaux	Royal Clusters ... 4 cr.
	Cuarta (4a)	Surchoix Extra	Choicest Clusters ... 3 cr.
	Cuarta Baja	Surchoix	
	Quinta (5a)	Choix Extra	Choice Clusters ... 2 cr.
	Quinta Baja	Choix	
	Mejor Alto M/A	Surcouches Extra	Best London Layers ... 1 cr.
	Mejor Bajo	Surcouches	
Loose	Reviso	Egrenés Royaux, 5 couronnes	Loose Muscatels, 4 cr., blue
	Medio Reviso	Egrenés Surchoix, 4 ,,	Loose Muscatels, 2 cr., blue
	Aseado	Egrenés Choix ... 3 ,,	Loose Muscatels, 2 cr., black
	Corriente	Egrenés ... ... 2 ,,	Loose Muscatels, 1 cr., black

It will be noted that the English grading is somewhat different.

The small, seedless loose raisins are termed Escombro in Spanish. They were worth, at the time of my visit, last December, about 5s. per case of 22 lbs. wholesale—the Reviso grade at the same time being worth twice as much. The correspondence of the different grades on the Continental and English classification as given in the above table is not absolute, but varies a little according to circumstances. The good ordinary dessert raisin shipped to France is the "Quinta" grade on the Spanish scale; it corresponds to "Choice" on the English.

Prices are fixed once a week by the Malaga Raisin Exchange. They vary enormously according to quality, as will be seen from the following list of average prices per 22-lb. case during the 1905 season:—

Imperial	Extra Imperial Clusters	120 to 150 pesetas	= 96s. to 120s.
Imperial Bajo	Imperial	112 pesetas	= 89s. 6d.
Royau		90 ,,	= 72s.
Royau Bajo		78 ,,	= 62s. 5d.
Cuarta Bajo	Choicest	56 ,,	= 44s. 10d.
Quinta	Choice	48 ,,	= 38s. 5d.
Quinta Bajo		44 ,,	= 35s. 2d.
Mejor Alto	Best Layers	38 ,,	= 30s. 5d.
Mejor Bajo	Ordinary Layers	32 ,,	= 25s. 7d.

Much up-to-date information concerning the Malaga raisin trade is to be found in the valuable report of M. M. Minangoin & Couston—*Les Raisins Secs en Tunisie*—published by the Tunis Government for the guidance of growers in the Regency. I am indebted to it for the prices quoted above.

This great variation in quality and therefore in price is an excellent proof of the unique nature of the Malaga raisin industry. These high grade dessert raisins are luxuries only to be produced in perfection by the exercise of much care and skill, and under the exceptional climatic conditions obtaining in that district.

SHIPMENT OF FRESH GRAPES.

Considerable quantities of fresh grapes are shipped from Malaga in barrels packed in cork dust. They are grown in several villages in the vicinity, such as Alhaurin and Coin, whence they are conveyed to Malaga for shipment.

Though the varieties grown and methods of culture are similar to those in vogue at Almeria, which district will be the subject of my next Report, it is as well to here note the different behaviour of such a stock as A.R.G.I. when grafted with the Ohanez or Almeria grape and trained on a high trellis. Under these circumstances, the growth of suckers and failure of the graft, which growers of the short pruned Gordo complain of, no longer occurs. This vigorous stock seems to find an outle for its surplus energy in the ample overhead training necessary to insure the fruiting of this scion and for this as well as for several other strong growers, A.R.G.I. is considered an excellent stock.

The training of the vines differs sometimes from that usual nea Almeria, where the horizontal overhead trellis or *Para* is the rule. Severa growers near Malaga have tried growing the Ohanez on erect trellises such as those we use for the Zante currant. They claim to be obtaining satisfactory results with less initial expenditure than that necessary t establish the elaborate overhead system.

Other matters in connexion with the shipment of fresh grapes ca best be described in connexion with the Almeria Industry.

In closing this brief description of the Malaga district I must than several of those to whom I am indebted for assistance and informatior From Mr. John G. Haggard and Mr. Thornton, H.B.M. Consul an Vice-Consul respectively, I received most valuable assistance. To Do Leopoldo de Salas y Amat, I am indebted for much valuable informatio and kind help. His reports, as chief of the "Comission Anti Filoxerica in the Province of Malaga, were of great use to me. To Mr. Frederic Eaton, Dr. Visick, Don Enriqué Nagel, Señor Molino de la Vega an Mr. Johanes Fr. Nölting I wish to also tender my sincere thanks.

* In reducing the above prices to English standard the value of the peseta is taken at par, viz., 25 pesetas to the £1.

THE PROCLAIMED PLANTS OF VICTORIA.

(*Continued from page* 416.)

Alfred J. Ewart, D. Sc., Ph. D., F.L.S., Government Botanist; and J. R. Tovey, Herbarium Assistant.

The Stinking Mayweed or Fetid Chamomile.

Anthemis cotula, L.

The stinking Mayweed or fetid Chamomile is a native of Europe, Asia, and Africa. It is common on roadsides, waste places, and if allowed to seed freely is apt to spread into pastures and cornfields and become troublesome. It is especially abundant along many stock roads, where travelling stock continually eat off the pasture plants and so give them no chance to keep down the Mayweed. The plant is obnoxious to stock on account of its unpleasant flavour, and if eaten by them in time of scarcity is apt to give their flesh, milk or butter an unpleasant flavour.

The plant is an annual, a foot or more in height, with glandular dots and one or more daisy-like heads on long furrowed stalks, but dwarfed on dry exposed roadsides and waste places. There are a few linear pointed scales between the minute flowers on each head; the latter lengthens out during flowering, and the leaves are much divided, especially the lower ones. Ray florets white and with no style, inner bracts of the head with scaly tips, seed-like fruits rough with glandular dots. It seeds freely but is easily kept under by ploughing and cleanly cultivation, encouraging the seeds to germinate and then destroying the seedlings by working the soil. The stouter pasture grasses, clovers and trefoils, will keep it down on pasture land if not grazed too closely. Infested stock roads should be narrowed to the breadth of the paved track and the sides ploughed and cultivated alternately. It would pay in most cases to allow the land-holder to take in the wasted border on condition of cleaning it and keeping it clean.

Proclaimed for the Shires of Maldon and Orbost.

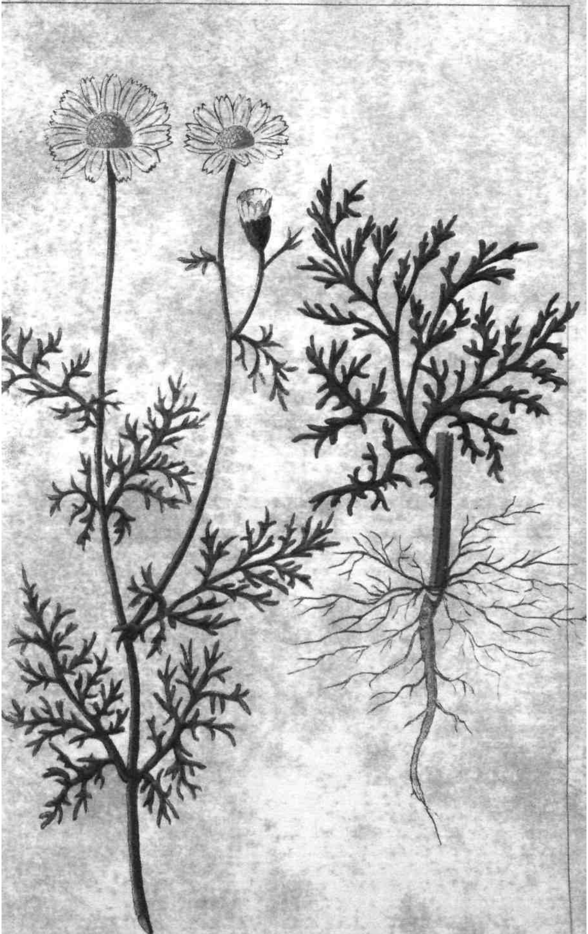
A SUGGESTION FOR WEED SUPPRESSION.

Alfred J. Ewart, D.Sc., Ph.D., F.L.S., Government Botanist.

At some recent prosecutions under the Thistle Act at Leongatha the Police Magistrate, Mr. G. Read Murphy, offered a series of prizes to the children bringing the largest numbers of Ragwort, a plant with which the district is infested, to the Head Teacher of the local State school. As the result, the Head Teacher writes to say that so far 19,943 plants of ragwort have been brought to him and that over 12,000 were brought in during the first four days. Apparently the idea has been very successful, and the children have for the time being cleared the district, more or less, of plants of ragwort of appreciable size.

There can be no doubt that the same idea might be extended to other districts infested by proclaimed weeds with great effect, although it seems hardly fair to throw a new burden on the already heavily laden shoulders of the local teachers. If the fines obtained as the result of prosecutions were devoted in some suitable fashion as rewards for their destruction, the good done by the Thistle Act would be greatly increased,

PLATE 27.



Waller, Del. A. J. Ewart, Direx. J. Kemp, Govt. Printer.

and an order authorizing police magistrates to devote the fines inflicted to that purpose would be of great value. The money would then be retained and utilized in the district affected, where it is usually most needed, instead of being lost to it.

The good effects of utilizing the services of the children in the manner above indicated are twofold. In the first place every one who has had anything to do with children and with plants knows how strong the natural destructive tendency of children is, and how much damage it can cause when uncontrolled. By directing this destructive tendency into proper channels we give their natural faculties full play and divert them from the useful shrubs, trees, birds, nests and the like on which they might otherwise be exercised. After a time the child should come to regard certain plants as he does snakes, *i.e.*, as something to be destroyed on sight. When he comes to man's estate and has land of his own, proclaimed plants will not be likely to thrive upon it. It is from an educational point of view, and by inculcating the spirit that certain plants, like certain animals, are natural though insidious enemies of man, that the idea of offering rewards to school children for their destruction is likely to prove of most use.

Nevertheless in France, and in other countries also, the services of children have been largely utilized to keep down or suppress plant or animal pests, and the direct good effects of children scouring the highways and byways for weeds are not to be under estimated. It is along roadsides that the problem of weed suppression is most difficult, and it is also along the roads that weeds spread most readily from one district to another. I have estimated that a plant of ragwort allowed to flower freely in a newly cleared district may, under favorable conditions, succeed in establishing 500 offspring besides being itself perennial. The 20,000 plants of ragwort collected and destroyed by the school children in a short time at Leongatha, and at an unfavorable period of the year, represent a potential 10,000,000 plants in the following season. Fair sized plants of ragwort run about 10 to the lb. when thoroughly dried, so that 10,000,000 plants represent not far short of 500 tons of organic matter which, in the form of sheep or mutton, would be of considerable value, instead of a dead loss to the district.

INSECT PESTS IN FOREIGN LANDS.

(*Continued from page 279.*)

SIXTH PROGRESS REPORT BY MR. W. W. FROGGATT, F.L.S., F.E.S.

Constantinople, 29th April, 1908.

I herewith furnish a brief report upon my work in England and while crossing through Europe to this place. As soon as I arrived in London I called upon the respective Agents-General of the States I am representing. I then presented my credentials to the Chief of the Entomological Staff, who took me round and introduced me to all the officers of the Zoological Department, and placed all their immense collections of material at my disposal. Here I spent all the spare time at my disposal going through the *Diptera* with Mr. Austen to see all their species of fruit flies, and though the Economic branch was discontinued last year,

I obtained a great deal of valuable information from the officers and the examination of the collections in their charge.

I visited the Zoological Museum at Cambridge University, where Dr. David Sharp is in charge, and spent a day going through the collections which contain many Australian specimens, and noting the methods adopted in the mounting and preservation of the museum specimens. Later on, I visited Oxford University. Here are deposited the very extensive Hope and Westwood collections containing the types of many Australian insects of economic importance, among them a collection of scale insects, probably the first made of these obscure and then little known insect pests. The collection of *Diptera* contained many specimens of fruit flies, some of great interest, such as several of Mediterranean fruit flies captured in London, and noted in Westwood's handwriting in 1840. At the invitation of Mr. G. H. Verrall, of Sussex Lodge, Newmarket, who has the Bigot and Meigen collections of *Diptera* in his great collection, I spent two days at his place examining these collections, where also there are many Australian types, and established the habitat of a number of *Dacus* and other fruit flies in Cairo, India, Africa and the Malay Islands, and found specimens of *Ceratitis catoirei*, closely allied to *C. capitata* species, but I think is a distinct species; it is only recorded from Mauritius and the Island of Bourbon.

At the invitation of the Hon. C. N. Rothschild (who is the greatest authority on that important group of insects—the Fleas), I spent a very interesting day with the Director (Dr. Jordan) at the Tring Museum at Tring Park, one of, if not the finest private collection of natural history specimens in the world. As you are aware, the bubonic plague and, it is suspected, even leprosy, has been spread to man by fleas, so that much attention has been paid the last few years to these insects.

I visited the Tropical School of Medicine attached to the Liverpool University, where Mr. Robert Newstead, the leading economic authority in England, has charge of the entomological work, and where the identification of all the insects and their parasites which have been found or are suspected of spreading tropical diseases, such as malaria, yellow fever, and "sleeping sickness" are collected and preserved. At the present time this school, which has made such wonderful discoveries in the advancement of medical entomology, has three expeditions in the field—two in Egypt and Central Africa, and the third in Brazil. The institution is well supported by the merchants of Liverpool, and at the present time they are subscribing funds to establish a Professorship of Entomology in connexion with the University. The damage to trade in Central Africa caused by "sleeping sickness" can hardly be estimated; the presence of the Blood Sucking Fly (*Glossina nobilis*)—closely related to the much better known Tsetse Fly of more Southern Africa—has altered the whole trade relations of a vast territory, and is spreading every year. This fly by biting man introduces an organism known as Trypanosoma into the blood and causes the death of infected persons. Just after I left London an International Sleeping Sickness Conference was held in London, where scientific men from Germany, Belgium, France and England met. An idea of the ravages wrought by the disease will be gathered on reading the following extract from an African newspaper issued last month :—

It is hardly seven years ago since the terrible and at present incurable malady known as Trypanosomiosis or Sleeping Sickness first made its way into Uganda from the Congo basin. In a few months it spread with terrible rapidity, and within a year of its appearance over 20,000 people died in the single district of

Usoya. Since then the population of the districts on the lake shore, and of the islands has been practically wiped out. Brayoma Island, a few years ago, counted a population of over 30,000. Two-thirds of that number have already died, and as the rest are all believed to be infected it is only the matter of a year or two before the complete extinction of the sturdy race of islanders who defeated Stanley and Metesa of Uganda, and were with difficulty subdued by Sir F. Lugard, is accomplished. In all some 200,000 out of 300,000 are estimated to have died already in the infected area.

I also visited the London School of Tropical Medicine, where I met the Director, Sir Patrick Manson, and Colonel Alcock, late of the Calcutta Museum, but now in charge of the entomological work of this institution. This work is carried on in connexion with the Sailors' Hospital at Woolwich, where all seamen infected with malarial diseases are received.

Among a number of other institutions visited, I might mention the London University, where Professor Hill, late of the Sydney University, showed me over the Biological section; and the Nottingham University, where Professor Carr has charge of the Economic Entomology. Here I also met the Rev. F. Thornly, who has charge of all the Nature Study work done in the schools of Nottinghamshire and Leicestershire.

The only Agricultural College in England with a scientific staff doing original investigation is Wye Agricultural College in Kent. I met Mr. F. V. Theobald, the Vice-Principal, who has charge of the Economic work, and went all over the laboratories, and through the orchards and experimental farms with him. One of the most important diseases at present under observation by the Pathologist (Mr. Salmon) is Warty disease or Black Scab of potatoes (*Chrysophlyctis endobiotica*, Schb.). Introduced into England about 1895 it has spread over nine counties of England and Scotland, and Mr. Salmon says could be very easily introduced into Australia with seed potatoes. I would suggest that it be proclaimed a disease under our *Vegetation Diseases Act*, and that a close watch be kept on seed potatoes coming from England.

Another fungus disease that has caused so much anxiety among fruit-growers in Great Britain, that the Board of Agriculture has had a *Vegetation Diseases Act* passed a few months ago to deal with it, is American Gooseberry Mildew (*Sphærotheca mors-uvæ*), and proclamations have been distributed and stuck up all over the country districts warning growers to look out for this pest on their gooseberries. Mr. Theobald informed me that in the pear orchards of England probably the worst pest is Bud Gnat, a small fly (*Diplosis sp.*) which lays its eggs on the opening flowers, in which the maggot feeds, causing them to swell out, and then drop off. There is also a small mite that damages the young gooseberries in a similar manner. Blight-proof stocks are unknown among the apple-growers in England. Most of their apples are grafted on the Paradise stock, which is very much subject to American Blight. Codlin Moth is very common, but most of the wormy apples are made into cider and very little trouble is taken with them. Canker in the bark is very common and attacks every bit of injured bark, often killing the trees.

At the request of Mr. F. Cooper (of Messrs. Cooper and Sons) I visited his laboratories at Watford, where chemical combinations for dealing with parasites of plants and animals are studied. He is doing some fine scientific work in conjunction with Professor Warburton of Cambridge University, in the study of cattle ticks and making very fine photographs and anatomical drawings of all the known species. Through want of time I was unable to visit their other establishment at Berkhamstead. At the request of Mr. Taverner (Agent-General for Victoria) I

called upon Mr. Middleton, in charge of the experimental work of the Board of Agriculture at Whitehall Place, who, with Mr. Rogers of the Intelligence Branch, gave me some information as to their methods of administration and carrying out of experiments.

I was able to attend the monthly meeting of the Entomological Society of London, where I gave the members a short address, at the President's request, on our Economic work in Australia, and met many of the leading entomologists of Great Britain. I also attended the monthly meeting of the Linnean Society of London at Burlington House. Having been four weeks in England, and gone through most of the important economic collections, I left for France on the 10th March and reached Paris the same evening. I engaged an interpreter, and next morning called upon Professor Marchell at the Department of Agriculture, and with him I spent three days, first going through his collections and noting his methods of work, and then in various institutions. At the Jardin de Plantes I found the Natural History Museum very beautifully arranged for the public, the nests of insects being particularly fine. I went through the cabinets of *Diptera* and other specimens. Professor Marchell informed me that the Mediterranean fruit fly has, on several occasions, been taken in the orchards near Paris, but it has never become established and has probably been brought in the larval state with imported fruit. The olive fly (*Dacus oleæ*) is common in several districts in the south of France, but has never become a serious pest, and they have no vegetation diseases law to deal with anything but phylloxera. I met the professor at the Pasteur Institute, which has charge of the specimens dealing with the tropical diseases, and I attended a meeting of the Doctors dealing with "Sleeping Sickness," upon which they are carrying out many investigations. I was also fortunate in attending the monthly meeting of the members of the Entomological Society of France, and there spoke on our work in Australia, my remarks being translated into Franch by Professor Picet. At Professor Blanchard's laboratories I met Dr. E. Brumpt, who has worked on biology in Central Africa, and is now investigating the Fowl ticks and their methods of transmitting diseases. At the College of France I met Dr. Felix Henneguy, who had done a great deal of fine work on the morphiology of insects. With Professor Marchell I went through the Experimental Gardens at the Luxembourg, and also to Professor Griffon's laboratories and experimental grounds, he being Vegetable Pathologist to the Department of Agriculture and Director of the Grenoble Station.

On the 13th March I left for Madrid and reached there on the following day. I first went to the Museum of Natural Sciences, where I examined the collections and met Dr. Boliver, the Director, who said they had plenty of specimens of olive fly, but none of the Mediterranean fruit fly, though it was at times a pest in the south of Spain. I visited the Agricultural Experiment Station and College where the Director, Profesor Navarro, gave me a great deal of information about the insect pests in Spain, and advised me to go to Valencia to see the orange orchards. I inquired about Mr. Compere's statement that has been so widely circulated through the newspapers, "that there was no codlin moth pest in Spain on account of the parasite he discovered there destroying them." Professor Navarro said, "That from his own observation he knew there was hardly an apple grown in Spain that was not damaged by the codlin moth, but as there was no export trade in apples, and the whole of the crop was usually turned into cider, the growers took no notice of wormy apples—

they all went under the press." Next day I called upon the Minister and the Director of Agriculture, and the latter so strongly advised me to visit the Valencia district that I arranged to take my interpreter, and visit the place, where the Department also has a large Experiment Station. I left Madrid the following night for Valencia *viá* Barcelona. On arrival at the last-named town early next morning we found that we could not get a train till evening, and so were all night in the train, but saw all the country when returning.

The whole of the land between the sea and the mountains south of Barcelona is well cultivated, the poorer land growing olives which can grow apparently without any soil, as long as they can get their roots into the limestone—where nothing else will grow the olive tree finds a living. At Tarragona there is a large well irrigated alluvial plain where a great many different kinds of fruit trees and vines are grown, then more poor country growing olives. At Castellon the orchards between the sea and the mountains right down to Valencia are all oranges, and the whole of the land is under irrigation. The crop was being gathered and great piles of low-grade fruit were scattered about the orchards and lying about the railway stations where they were packing. Dr. Marti (Director of the Station) says that fruit fly is practically unknown in the Valencia orchards, but further south, at Malaga, *Haltcrophora capitata* often does a great deal of damage in the months of September and November; but no methods are adopted to deal with it, though there is at present a Bill before the House of Parliament to give the Department of Fomento power to destroy all infested fruit in the orchards. Outside Valencia great quantities of vegetables, particularly potatoes, are grown in small fields which are all under-irrigated from the mountain streams.

From Valencia I went straight through to Montpellier (France) to the celebrated Viticultural and Horticultural School, and though the Director was away in Paris, through the kindness of the Secretary I went over the Entomological Division under Professor Mayet, and through the experimental grounds. Among some interesting experiments noted were those of growing plots of vines in ground covered with a porous cement made of slag and concrete, with the surface painted in different colours, and, under similar conditions, ground covered with a coating of river gravel and flagstones. From here I went to Marseilles, and was fortunate in catching a boat leaving for Naples next morning.

I landed at Naples on the 27th March, and went out next morning to Portici to the R. Scuola Superior di Agricoltura, where I met Professor Silvestri and the members of his staff, and obtained a great deal of interesting information regarding the destruction of the olive oil industry by the ravages of the olive fruit fly (*Dacus oleæ*). To give some idea of the actual damage done, the following figures from their reports may be quoted :—

In 1879-83 the yield of olive oil in Italy was 3,390,000 hectolitres.
In 1884-89 it dropped to 2,354,000 hectolitres.
In 1890-94 it rose to 2,514,000 hectolitres.
In 1895-99 it fell to 2,005,000 hectolitres,

and has not improved since the last records were compiled, and as each hectolitre (22 gallons) is valued at about £4, the pest is a national one. There is a standing reward offered by the Italian Government of 6,000 lire (1 lira = 9½d.) for any effective remedy for the destruction of the olive fly, so that all the Italian entomologists are turning their attention to this pest. Professor Silvestri is a great believer in its control by

parasites, and parasites alone. The other side, represented by Professor Berlese at Florence, whilst believing that the indigenous parasites will do some of the work, also advocates the use of mechanical means to supplement the work. Berlese has used a mixture consisting of arsenic, honey and molasses diluted with water which he has compounded and sprayed over infested areas with marked success, the adult flies coming into the poison and dying after feeding upon it. The chief difficulty is the expense and the fact that heavy rain washes it off. He is now experimenting with jars or small bottles containing this mixture hung in the trees with bundles of cotton threads placed in the bottles and trailing down several feet, down which the fluid is drawn, and upon which the flies rest and feed. Silvestri claims that, if sprays are used, all the parasites will be destroyed, but, as far as I can learn from both sides, where the parasites have had a fair field, with nothing to disturb them (and quite a number have been bred from the fruit fly maggot and pupa of the olive fly) the increase has not yet been checked after all these years, though there is much more hope for a parasite to be effective in a thin-fleshed fruit like an olive, where the maggot is close to the surface, than in an orange where the maggot is out of reach.

At Dr. Silvestri's suggestion, furnished with a letter of introduction to Dr. Perez in charge of the Agricultural work in Sicily, I started for Palermo by the mail boat, reached the town at daylight, spent the day with Dr. Perez in the lemon orchards outside the town, and left for Naples again, the same night. In consequence of the bad condition of the lemon trade, the greater part of the crop is still on the trees. There is a large area of rich volcanic land between the mountains and the town covered with orchards, principally devoted to lemons. All of the orchards are under irrigation. Most of the trees are small, though many of them are 60 or 70 years old. They are planted so close together, and as they are grafted on sour orange stocks about 4 feet above the ground, they have all their foliage above, interlacing their branches and thus forming a regular thicket so that they have little chance to expand. The growers claim that this high grafting or budding (for they do both) prevents collar rot or gumming. Dr. Perez says that every year they lose a certain percentage of the oranges in Sicily and on the mainland in Southern Italy from the fruit fly; but it is not considered a serious pest, and no precautions or methods are adopted against it.

From Naples I went to Rome, where I stopped a day to see Dr. Grassi, the great authority on White Ants (*Termitidæ*), and went over the Agricultural Museum, where there is a very fine collection of agricultural products. Next day I reached Florence, where I particularly wished to meet Professor Berlese, who has done so much work on fruit flies. When I reached his laboratories next morning I found he had just left for Genoa, so telegraphed to him that I would follow on next morning. His staff showed me all their methods of work, and particularly their experiments against the olive flies. One of the worst scale insects in Italy is *Diaspis pentagona* which attacks the Mulberry, and, if neglected, often kills the trees; it is this scale that Professor Berlese had gone to report upon, and had taken some hymenopterous parasites he had received from Japan to liberate them in the mulberry gardens north of Genoa. I arrived at Genoa that evening, met Professor Berlese, and had an interesting talk with him on his methods of dealing with the olive flies, and gave him some idea of what we are doing in Australia. I saw him off next morning, and then called upon Dr. Gestro, who has charge of the Genoa

Museum, where the D'Alberti collections made in New Guinea are deposited. I also went to the Botanical section of the University of Genoa, where they have a very fine herbarium and collection of living plants.

From here I went to Vienna *viâ* Milan, where I had to change trains, and left the latter town at midnight; and passing through Northern Italy, reached Vienna the following night. Next morning I went to the Museum, and met the Director, Dr. Gangbhaur, who introduced me to the staff and placed the collections at my disposal. This Museum contains some very valuable collections, and is particularly rich in economic ones, such as Signoret's collections of *Coccidæ* (Scale Insects) and the combined collections of *Diptera* made by Schiner, Weidmann, Meigen, and Lowe. I spent a considerable time over these collections and made many notes on Signoret's types of Australian scale insects, and a number of notes on the named fruit flies in the *Diptera*.

I then visited the laboratories of the Experimental Station of the Department of Agriculture, where I was shown over the buildings, and met Drs. Wahl and Fulmer, who have charge of the economic entomology and vegetable diseases of plants, and have made collections of all the pests found in Austria. Among them, leaf-devouring caterpillars after the class of the web moths seem to be the worst, while several weevils of the genus *Cleonus* do a great deal of damage to sugar beet. After another morning in the Museum, spent the afternoon at the Chemical Laboratories, and the Veterinary, Viticultural and Peat Branches; the latter deals with the utilization of the large deposits of peat which is largely used for fuel in manufacturing spirits. The Fisheries Branch was closed, as they had a show on at the Agricultural Show Grounds. The following morning left for the Show Grounds at St. Marx at 7.30, and reached there a little after 8, before the crowd. The fish exhibit consisted of about 300 glass-fronted tanks placed round the walls full of living fresh-water fish (for which Austria is noted), some of the fish being so large that there did not seem to be room for them to swim. There must have been quite 10,000 living fish exhibited, besides quantities of the small fry showing their development. I was invited to a conference of the Fisheries Experts by one of the Commissioners to whom I went for information, but had to leave before it took place. The next and most remarkable exhibition to an Australian was the collection of, and the interest shown in rabbits. I counted 600 cages, most of them containing three or four animals and comprising all the breeds and varieties known, Belgian, Russian, Japanese, &c., many of them grown to a great size—larger than hares. The judges weighed each animal on the scales, measured it even down to the length and shape of its ears, and I wondered what an Australian squatter would have thought of this section in our Royal Agricultural Show. The other sections consisted of pigs, of which there were a great number, chiefly white Yorkshire; and cattle, mostly Swiss. Besides these there were manures and agricultural implements, principally of English manufacture. From here we went on to the Natural History Museum, and went through the general collections on the three main floors with the Director, who explained the plan of arrangement. We then returned to the offices and went through injurious *Lepidoptera* with Profesor Rebel, who, besides being in charge of this Department in the Museum, lectures to the students at the Agricultural Department.

Next afternoon I left for Budapest, arriving there the same night. On the following morning I met Dr. Howarth, Director of the Royal Museum of Hungary, and with Dr. Kirtez, one of the greatest authorities

on the *Diptera*, went through their collections, and obtained a great deal of information about the distribution of the fruit flies, particularly those collected some five years ago in the East by Bero. In the afternoon I visited the Central Bureau of Ornithology under the charge of Dr. Otto Herman, who has raised this Branch of the Department of Agriculture into one of the best known in the world, second only to the United States Bureau of Biological Survey at Washington. Under this, useful birds are protected, both on account of their insectivorous habits and value as game birds; exhaustive studies are made on the migration of birds, and nests are constructed in large quantities and placed on the islands in the Danube, and distributed among the Forest Guards and Inspectors. Through the schoolmasters, literature on the value and uses of birds is distributed, and even specimens are given to the children's school museums.

With Dr. Howarth, I called upon the Minister of Agriculture (Dr. Daranyi) who is one of the foremost agriculturists in the country, and afterwards went to the Agricultural Museum, which is built on an artificial island. It is unique in its way, and has the finest collection I have seen. It comprises all kinds of agricultural implements, all products made in the country, raw products, models and pictures of all kinds of stock and methods of dealing with them. It includes all branches of forestry, animals and birds found in forests, and dead and living fish, the old and modern weapons used in hunting, and the harness and implements used by shepherds, stockmen, and fishermen. The collection is beautifully arranged in a very fine building, which cost £50,000 when built as part of the Hungarian Exhibition. I also visited the City Markets, another fine block of buildings, where every kind of product is sold, from flowers and fruit to the curious curly-haired Hungarian pigs, lambs, and live fish. All the oranges in the Market belonged to two kinds of blood oranges, sweet, but rough skinned, and said to be imported from Italy. The Technical Branches of the Department of Agriculture are housed in a very fine set of modern buildings on the Buda side of the Danube, and have fine grounds and experimental plots of ground round them. Here I met all the experts of the Department. Dr. Fablonowsky, the Assistant Director, is also the Entomologist, and had a very fine collection of all kinds of injurious insects and samples of the damage done by them exhibited in cases. The phylloxera has done an immense amount of damage to the viticultural industry, and in all clay or loamy soil they are re-planting with American stocks, or going into the light sandy soil of the hills where the phylloxera cannot exist. This has to a considerable extent changed the nature of the vintage, and they produce a great deal of light wine that is chiefly sold in Germany and Northern Europe, but will not sell in England. The Government has constructed some very extensive wine cellars in the side of the mountain, outside Buda, down the river, where they mature a large quantity of wine grown in their own vineyards of 2,500 acres. Here they also have a staff, and train ten young men as "Cellar Masters." I visited these cellars, and was shown all over the Institution, where they also hold auction sales of wine four times a year. I also had the opportunity of going down to Nyiregyhaza near Tokay, at the invitation of Dr. Kallay, and visited some vineyards, where I found the rows are planted so close together that everything has to be done by hand once the vines are planted. Most of the small growers sell the grapes, or simply press the grapes and sell the must to the larger growers who have wine-cellars. All the soil here and round the hills of Tokay is very fine and sandy, and phylloxera-proof, with few exceptions.

On the 21st April I left by the Orient Express at midnight for Constantinople, on my road to Cyprus and Cairo, and reached there on the

morning of the 23rd. Soon after my arrival I found that I could not get a steamer till the 30th, so called upon the British Consul, who very kindly gave me letters to several people interested in agriculture. At the invitation of Dr. Thompson, a British merchant interested in wine culture, and having large vineyards at Bolandjik, about 12 miles out in Asiatic Turkey, I spent an afternoon at his orchards and saw the methods used there and in some Turkish vineyards adjoining. At one time they made a large quantity of wine, but owing to the bad times that came to the Armenians, the chief wine drinkers in Turkey, they have given up making wine, and now sell the grapes for eating. All the orchards through Turkey have been more or less destroyed by the phylloxera, which appeared about 25 years ago. Dr. Thompson's vines, now twelve years old, are all grafted on American stocks, and are some of the largest vines I have seen. They are simply staked, and tied up at the top. Most of the Turkish wine-growers graft on a native grape that grows wild in the country.

With a letter of introduction, I called upon Monsieur C. de Raymond, Inspector, Technique de la Dette Publique Ottomane, who has charge of the work done in connexion with helping the vine and silk industries. Mr. Raymond informed me that they distributed cuttings and mulberry plants free to encourage the industry, and the introduction of silk has increased in Turkey in Europe from 1,871,739 kilos of cocoons in 1902, to 3,623,145 kilos in 1907. A kilo is equal to 2 lbs. 3¼ ozs. Wine-making is in a very bad way, but the Smyrna raisin industry is one of the big industries. This Department also deals with Forestry and Fisheries, but does no re-planting, simply collecting the licence-money from the timber getters.

In the fruit markets, one of the sights of Stamboul, there are a great many varieties of oranges and other citrus fruit offered for sale, and I am informed that the commission agents fix the selling price to the retailers every morning. The Jaffa orange is a very large long orange with an extremely thick skin, but has a very fine flavour and very few pips; buying from the basket-men they vary from 1d. to 1½d. A very fine blood orange, and a fine round orange with a thinnish skin come from Syria. From Syria also comes a very large deep-coloured mandarin, which has a very loose skin, and is as sour as a lemon. These I am told are boiled in sugar and made into sweetmeats. Large quantities of the lemons, and some oranges also come from Sicily and Italy. I saw no signs of fruit fly among them, but scale was pretty thick upon some Syrian ones, *Aspidiotus hederi*, and *Chianaspis citri*. Apples are scarce and very poor at this time of the year. They are chiefly grown at Amasa in Turkey in Asia, and are a small red variety. Bananas are practically unknown in the markets, but some come to the fruit shops from Egypt, and are a luxury. The vegetables are very fine and of many kinds. Nearly all are grown in the Asiatic side of the Bosphorus, while dried fruits and all kinds of nuts, grain, and legumes, are very abundant and cheap. There was almost a total failure of the harvest in Asia Minor last season, and rain is wanted very badly now. All the vineyards are dug by hand. The Turkish labourer uses a very heavy fork with two straight prongs and a long handle, and two of them working together turn over a great mass of soil at each dig. They work from 7 in the morning to 6 in the evening, and get 1s. 4d. a day.

I leave here to-morrow at 4 p.m., in the M.M.S. Co. boat to Cyprus, and should reach there on the 4th or 5th of May, and leave there a week later for Cairo.

A FARM IN THE MAKING.

The Geelong Harbor Trust's Farm, Sparrovale, Geelong.

J. S. McFadzean, Dairy Supervisor.

The wealth of a nation depends primarily on the fertility of its land. A country rich in minerals may become opulent through possessing the wherewithal to buy largely of another nation's food products, and thus for a time hide its own deficiencies; but its position is dependent on an unknown and unstable quantity. All necessaries of life are produced from the soil; and the more highly developed a country's agricultural resources are, the greater is its self-contained wealth. Farming is the one original and fundamental occupation; all other businesses and professions are either its offshoots or its parasites. Every one whose labours are directed towards increasing the productiveness of the soil is permanently raising the commercial prosperity of that country in a degree corresponding with the success of his efforts. A man may engage in trading, and should his venture not be a financial success, he may go out of the business again, leaving the world at large neither better nor worse for the time spent, for he has been but a medium of exchange; but every tree felled or furrow turned marks an advancement in the development of the world's food supply.

With the opening up of any district for agricultural purposes, those portions that are the most easily brought under the plough are generally the first dealt with, as they admit of a more speedy return being obtained from the work; and, when working capital is limited, a small quick return is more useful than one larger, but longer in coming to hand. This is often the cause of highly-productive areas, which are heavily timbered or otherwise difficult to bring under cultivation, being left practically idle for long periods, while poorer country more easily opened up is being worked; till later, when individual effort has succeeded sufficiently to allow for the initial cost of the undertaking, or by united effort in the form of a partnership or company, these richer areas are taken in hand and worked successfully.

Reclamation of Useless Land.

Something of this character has taken place on the lower reaches of the Barwon River, about five miles south of Geelong. In that locality, which is known as Connewarre, there is a large area of several thousands of acres of low-lying ground that was apparently at one time a shallow bay into which the river emptied itself; but which, silting up gradually, has eventually been formed into swamps, through which the river slowly finds its way to the sea. On either bank is water-logged land over which there is a slight tidal flow excepting when the river is in flood. Bordering on this are farms of various sizes that have been settled for quite a number of years. Some larger areas have been held by municipal and other corporations, and, at the northern end where a breakwater was constructed against the tide in 1841, there are several mills and factories treating such raw products as wool, hides, bark and the like. At various times, there has been talk of opening up this waterway from the sea to some point close to the Town of Geelong, sufficiently to permit of the carriage of merchandise; but it has been generally considered that the time was not yet ripe for such a large undertaking. The inevitable silting up of the

channel by floods would call for constant work, the expense of which could not nearly be covered by such returns as are at present in sight from that source.

Among the larger areas bordering on the swampy country is one of 600 acres that was held on Government grant by the Geelong Racing Club and which was fairly well improved for its purpose. A short branch line ran from the main Western District railway to accommodate passengers and other traffic on race days. As this site of late years had not been altogether satisfactory from a gate-money stand-point, an offer from the Government of an exchange under certain conditions was accepted; and the Racing Club's improvements were moved to the new grounds close to Geelong. Prior to this an Act of Parliament was passed by virtue of which the Government took over three other areas which were known as the Geelong, South Barwon, and Connewarre commons, containing respectively 500, 370, and 960 acres. Only a portion of these, in addition to the old race-course paddock, was liable to be flooded, and that only after heavy rains; and on these commons grazers were taken by the Borough and Shire Councils, at 4½d. 3d., and ¾d. per cow per week. Another area of 1,750 acres of principally swampy land, known as Reedy Lake, and which had been let at a yearly rental of £14 8s. per annum, was also resumed, as well as a further 5,400 odd acres of adjoining swamp which was partly in the Bellarine and partly in the South Barwon shires and from which practically no return was being obtained.

These several areas representing a total of over 9,500 acres were handed over by the Government in December, 1905, to the Geelong Harbor Trust as an endowment, with the power to make further purchases, to sell, or to alter them and the waterway through them at any time as deemed advisable. Since then the Trust has purchased two other blocks of 104 and 242 acres that were almost within their boundaries. The Geelong common which formerly brought in about £100 per year in agistment fees is now subdivided into blocks of from 60 to 200 acres each, and let for agricultural purposes at an average of 20s. per acre yearly, on leases of from 3 to 9½ years. Improvements are erected by the Trust as required, the tenants paying the interest on their cost. The South Barwon common is now bringing in about 20s. per acre per year for agistment fees. Later on it is intended to subdivide this into smaller areas, and provide facilities for its systematic irrigation from the river. This should prove a profitable work, as small properties adjacent to it are let for market gardening at from £7 to £10 per acre per year, and those renting them have also to pay for the water used through the meter.

The Reedy Lake was sometime since put up by tender, and let at £132 per annum; but the lease was shortly afterwards broken, and it was re-let for £750 for six months. The old race-course property and part of the adjoining land is now being drained and otherwise improved with the object of making it into an extensive dairy farm; and the work of reclaiming the rest of the property will next be proceeded with. This race-course property has now been named the Sparrovale Farm in honour of Mr. E. R. Sparrow the popular stock salesman, who has successfully filled the office of secretary to the Geelong Racing Club for many years past.

A Large Agricultural Undertaking.

Public opinion is usually sceptical of the ultimate success of large agricultural undertakings. Some large projects have been carried out successfully, others have been failures; but the same can be said of smaller

concerns, and of every line of business. Some of them may fail in their original proposition, and yet succeed beyond expectation in another direction through taking advantage of some previously unforseen circumstance. Sifted out, the matter resolves itself into a question, as with all businesses, large or small, of proper management and qualified workmen. With these provided, the balance should be in favour of the large concern, both on account of the comparatively larger capital at its disposal, and the possibility of the expenditure being reduced on account of the wholesale principle on which it is conducted. Conversely, if unsuccessful, losses which would appear trifling on a small farm will be magnified in accordance with the extent of the operations. On every farm, large or small, similar work has to be done and difficulties faced, but with the difference again in favour of the larger farm, in that, as the work as a whole is larger, each separate item is more conspicuous, and if any mistake or mismanagement occurs in any section, it should be the more easily observed, and the more speedily remedied.

As regards the management, every army must have its commander, but it is not necessary that he should be a man of either high physical development or skilled in the use of weapons. His position demands, among other qualities a thorough grasp of the requirements necessary for the execution of the work before him, the ability to choose his officers with discrimination, and, above all, that his mind should be capable of attention to either large undertakings or minute detail, according as exigency may demand. As with the commander of an army so with the leader of any industrial enterprise; and it is not necessary that a man be either a good milker or a machinery expert in order to successfully superintend a large dairy farm. If he knows how the work should be done, gets together competent men to do it, and sees that it is done, there need be no fear for the success of the project; but, as a chain is the strength only of its weakest link, so also will any incompetence in any part of the work tend to a reduction in the total returns relatively commensurate with the importance of that section.

With this project of the Geelong Harbor Trust, however, there would appear to be no possibility of absolute failure. Some of the smaller items of the scheme it may be found necessary to change, and some are even now being varied; but these can have little bearing on the project as a whole. The foundation of the work is the reclaiming of a large amount of waste ground that in its unimproved state was useless; but which, if properly drained and cleared of scrub, is of high agricultural value. The dairy farming part of the scheme is but a very small item in the whole, and the amount of money being spent solely on it is comparatively insignificant; nevertheless, many take upon themselves to criticise the whole undertaking merely on the possibility of this section not proving a success. However, the ultimate result of the dairy-farm portion of the undertaking will not be failure either from want of funds or extravagant expenditure. The buildings are being erected reasonably substantial, and without any waste of material; they are situated favorably for drainage, shelter, and convenience. The working scheme is planned to take advantage of the various conditions of the farm; and those in charge of it intend making full use of all that can be learnt from both practical and scientific sources.

The only noticeable disadvantage at the present time is a temporary one, namely, the possibility that dairying was begun too soon, or on too large a scale for the season, as the stock have fallen rather low to be

considered in good dairying condition. But the same might be said of 90 per cent. of old-established farms this year, and every one is equally liable to misjudge climatic possibilities. However, the success of the maize crop just harvested into the silos is a counteracting feature, and the various draining and irrigation improvements already completed should prove a safeguard against such an occurrence in future.

The whole of the works on the property have been carried out under the personal supervision of the Engineer of the Trust, Mr. A. C. Mackenzie, A.M.I.C.E.

The dairy-farm and drainage operations are under the management of Mr. Baird, who has taken it over on the share system, and who was chosen for the work on account of his previous experience and success in such general farm practice. The advice of Mr. G. Harmer, the Government Dairy Supervisor in charge of the Geelong district, was also taken advantage of in reference to the position and construction of the dairy buildings and other work of the farm.

THE HOMESTEAD AND FARM BUILDINGS.

The western boundary of this property is a lane that runs down to the main road to Barwon Heads. The entrance to Sparrovale Farm, being the same as that of the old race-course, is from this lane and a good road runs direct to it from Marshalltown. The continuation of this road, with its fine avenue of trees that led from the gates to the course, is now the beginning of the main farm road leading to the several paddocks. On the left of the entrance gate is the manager's residence, round which a flower garden and shrubbery are being laid out; and on the right is an acre of ground reserved for the future nursery. This latter, and the rest of the horticultural work, is in charge of a practical gardener and forester, who will raise and plant out such trees and shrubs as are required for shelter, ornamental, and general garden work. From the nursery, to the right along the western boundary, several ¾-acre blocks are reserved for the erection of dwellings for employés. Behind these blocks is another reserved area, about 5 chains wide, and of this a poultry yard will occupy that portion that lies at the rear of the nursery and adjoining the farm road; and the rest will stand as a horse paddock till otherwise required. Next to the poultry yard, in a parallel line with the frontage blocks, and at right angles to the farm road are built, first the calf sheds and yards, and behind them the first of six feeding and shelter sheds for the milking stock.

This calf-shedding was designed by Mr. Harmer to accommodate 20 to 30 head, and is in four sections with two exercise yards. The first three sheds with small yards are for the young calves till taught to drink from the trough, and the large shed and yard are for those more advanced. The calves as brought in will be housed in the end pen. They will be taken into the second pen while being taught to drink from the bucket. As soon as they drink freely they will be passed on to the third pen in which is a trough and a low hay-rack, and which has the small exercise yard adjoining. When they can be trusted to look to the trough for their drink they will be passed on to the larger place where there is also a trough and hay-rack, and more room; and there they will be kept till able to do with less care.

The six shelter-sheds for the milking cows are to be each 415 feet long by 13 feet wide, and fitted to stall 100 head. Midway along each

shed is a storeroom for fodder, 25 feet by 15 feet, and through this a tramway is to run down the shed in front of the manger to facilitate the work of feeding. One of these sheds is now completed and the remaining five are to be erected as required on the same principle and on the space reserved for them in the same paddock. This paddock has a gentle slope to the east, which will allow for good drainage of the sheds and approaches. Lower down the hill from these sheds provision has been made for twelve small paddocks to be used for the milkers at night in fine weather. It is the intention of the management to keep the cows in lots of 50 head, treating each as a separate herd. This will allow of extended feeding or other tests being made, such as may be likely to lead to improved methods, and prove instructive to such students as may seek to gain practical experience on a large farm carried out on up-to-date principles.

Across the farm road, and adjoining the grounds surrounding the manager's residence, about an acre has been reserved for any future building requirements that may arise. At the far end of this area from the road, on the left side, the employés' quarters are situated. These comprise a large weatherboard building containing kitchen, dining-room, two dormitories, and two bath-rooms, all lofty, well lighted and neatly fitted. The dormitories call for special mention. They run lengthways from the dining-room, off which doors open to both. At the far end of each are the lavatories with plunge and shower baths. The berths are in two double tiers, each containing a roomy bunk, with wire and kapok mattrass, locker, shelf, &c. The windows are fitted with fly-wire and the whole place is roomy and well ventilated. Better arranged quarters it would be hard to find, and much credit is due to the management for thus thoughtfully providing for the comfort of their men after the day's toil. Were more consideration shown by employers in this and similar ways it would tend towards producing a better class of labour, the lack of which is often commented on by dairymen.

The dairy buildings are situated on the immediate right at the entrance of the last-mentioned reserved area. The first of these is a two-storied brick building, the lower portion of which is to be fitted as a refrigerating-room. Upstairs is the milk testing room, which it is intended to furnish with every convenience requisite for the work—Mr. Baird being a very firm believer in the benefits to be derived from systematic testing of the yields. In the next building to this the separating, cooling, and general dairy work is done; and a pulley-hoist is at the door for loading and unloading the milk. Next to this is the boiler-house, and a temporary steaming-room with vats for scalding feed as required for any of the stock. Still following down the right side of this reserved area the last of the buildings is the stabling. All of these, with the exception of the steaming-room, have bricked floors, and they are kept as clean as their several uses will allow. Again returning to the main farm road—to facilitate description—the next building to the refrigerating-room, but across a wide entrance-way, is the milking-shed which stands parallel with the main road. This is the first of the proposed four, and accommodates 50 cows—25 on each side—with a feeding passage down the centre. It is fitted for Hartnett machines, twelve being in use, driven by 6-h.p. engine. The bails are shut and opened in section by an ingenious yet simple system of pulleys and weights which was designed by Mr. Mackenzie, the Trust's engineer. The lower boards on the side of the shed are made to hinge up to allow

of airing the shed and drying the floors. A small yard at the shed entrance, between it and the receiving yards, allows of the coming in and going out of the cows from each side of the shed quietly and quickly. When completed, the bringing in of the feed and removal of manure from all the sheds will be done by tramway. The situation of all this shedding is similar to that of the shelter-shed, being high and dry on an easterly slope. Space has been reserved for another milking-shed and roadway beside this one; and adjacent to that are erected two of the proposed four silos.

The silos are of concrete, constructed on the Monier system, circular, 35 feet high by 25 feet in diameter; erected by contract at a total cost of £397 for the two, and estimated to hold 350 tons of fodder each. This would appear to be a very conservative reckoning of their capacity; for the one filled took over 500 loads of maize, at an estimated average of 1 ton per load, and the 189 loads put into the second one did not half fill it. The heavy pressure on the lower half of the filled silo forced the sap to permeate through the wall, and it kept oozing out and trickling away for days, no provision for drainage having been made when building them. It would appear also that more care in construction especially at the union of the cement blocks is necessary. The maize was chaffed, the cutter and elevator being driven by the farm traction engine. The work of filling, shown in the illustration, was carried out at the rate of about 50 tons a day. The other two silos when built are to be between these and the stabling.

When the full proposed extension of the milking-shed is built it will occupy a portion of the space now taken up by the receiving yards; and the barn and stack-yard will be together below this, and following up the line of the silos. A grain-crushing machine has just been put up in the barn. The mixing bins will be finally built there, and the feed tramways laid from there through the milking-shed. Below the silos and barn, and across another road space, down the whole length of the side of this farm-yard, have been constructed five large yards, the whole being fenced in and subdivided with 8 ft. iron. These are at present used—four as bull pens, and one for the boar and eight breeding sows.

THE FARM STOCK.

The bulls are pedigreed Ayrshires, three yearlings, and two rising three years old. These, with nine Ayrshire heifers, were purchased at the clearing sale of Mr. Grant's Toolern herd: and their breeding is a guarantee that no better beginning could have been made in the formation of a herd of pedigreed Ayrshire milking stock. The rest of the milking stock on the farm (about 300 head) has been purchased in lines as springing heifers. These as they come in are branded on the horn with the milking-shed number. At two milkings weekly, a night and the following morning, each cow's milk is weighed, and the week's yield estimated therefrom. The bails are numbered from 1 to 50, and as the cows stand bailed their numbers and that of the bail they are in, are noted from the feed-alley; and as the attendants bring up each cow's milk for weighing the bail number is given, and the cow's number is beside it in the book. This system has now been tried in practice for three months, and is satisfactory both as to exactness and quickness of execution. The regular testing for butter fat quality of the milk will be proceeded with as soon as the

room is fitted. To some this special fitting up of a large room for this work may appear unwarranted; but it must be remembered that this is a farm beginning on a large scale with purchased stock, and intending to milk 600 head when in full working order; therefore preparation must be made for the work of culling right from the first. No dairyman, however small his business may be, can afford to keep unprofitable cows in his herd, though many do so; and though one such cow in a lot of five is of far more importance to the owner than 100 will be to this large concern, yet the man with the five cows is the more likely to overlook the fact and suffer loss in proportion. This weakness the average farmer has for bailing-up, feeding, and milking unprofitable cows is one great breach in his general common-sense methods. His horses must be fit for their work, or he will not keep them; he can estimate the profit on his pigs almost to a shilling; if his separator leaves a suggestion of cream behind it the agent will hear from him next day; but almost any cow that will bring him a calf once a year is permitted to share his profits unquestioned; and the one that can fill a bucket with milk of any quality for twelve weeks each spring, is a pensioner on the farm for life. That kind of practice is all too common. It is, however, fully recognised on Sparrovale Farm that among the heifers purchased there may be a large percentage that will not prove profitable milkers, and if so, the sooner they are out of the herd the better; but they have first to be sorted out, and by regularly weighing the quantity of milk given and testing its quality periodically Mr. Baird is going the quickest and surest way to the end he has in view, viz., the building of a dairy herd in which every cow is a profit-earner. It is when reckoned up on such a large scale that the necessity for this work stands out in its colossal significance.

The horse stock on the farm at present comprises 29 head—19 farm draughts and 10 for harness and hack work. Of the farm horses, 15 are mares; these are all on the young side and have been selected with an eye to future breeding operations. Amongst them are daughters of the famous "Sir Percival" and the more recent Clydesdale Champion "Lord Dundonald." They will be mated during the forthcoming season with the New Zealand bred Clydesdale colt "Corporal" by "Chief Commander" ex "Violone" by "Royal Conqueror." This colt had a successful show season as a two year old in the North Island and was selected by Mr. S. S. Cameron, Chief Veterinary Officer, during a recent visit to New Zealand; so that, apart from his usefulness for home breeding, the introduction to the district of a sound, clean sire of Clydesdale type is guaranteed, and will doubtless be fully appreciated by breeders in the neighbourhood.

Of the buildings on the farm there remains now only the pig-fattening pens to be mentioned. Those pens at present erected are in a parallel line with the end fence of the furthest bull paddock. They are in three sheds of twelve pens each, and at present contain about 140 pigs of various sizes. It was proposed to build altogether five of these sheds, with the object of using the separated milk for fattening; but the recent scarcity of fresh milk in Melbourne has resulted in this farm also becoming a metropolitan supplier, and in all probability it will continue so; for with its convenient situation, good water supply, and facilities for growing and conserving fodder, this method of disposing of the produce has everything in its favour from a commercial stand-point; and as pig fattening is an unnecessary adjunct to this branch of dairying it is likely that this part of the scheme will be set aside for the present.

At some distance below the styes is the farm manure pit to which the drainage runs from all of the shedding, to be distributed later over the cultivation as required. The pit is bricked, 30 feet long, 18 feet wide, and 6 feet deep, and looks roomy enough for a large farm; still it could have been duplicated with advantage to permit of the better rotting of the bedding litter which is carted to there. This bedding is mainly composed of rough swamp grass, and serves its purpose both cheaply and effectively; but the toughness of its fibre is almost equal to flax, and more complete rotting would improve it as manure.

Character of the Soil.

The area occupied by the buildings and yards, together with the land reserved for further extensions of them, and a portion of a 50-acre paddock adjoining the shelter sheds, constitutes about the whole of Sparrovale that is above the flood line of the Barwon River. The rest—about 600 acres—is now being channelled on the surface for irrigation, laid with underground piping every 5 chains for draining, and protected with levee banks from the river in its ordinary floods.

All of this 8,000 odd acres of swamp land that is now in possession of the Trust has always been more or less subject to inundation after every heavy rain. The Barwon, with its tributaries, the Leigh and Moorabool Rivers, flows through fertile and settled country; and each flood bringing down with it a quantity of the mixed surface soil from the several water-sheds, has left it as a deposit over all this area. Just after a flood this silt is a slimy brownish yellow mud that appears only to smother the vegetation beneath it; but as it dries it cracks and crumbles, the grass (principally water couch) forces up through it, forms fresh surface roots, and flourishes anew. Where the rush of the flood has been in any way hindered by higher ground, the eddying of the water has resulted in a heavier silt deposit; and, as the whole area of this swamp is slowly getting more shallow, these portions are gradually coming less within flood mark and assuming more of the character of the higher land adjoining. It is intended that one of the first steps towards the reclaiming of the lower swamp land will be the forming of ridges in suitable positions to assist in this natural silting work.

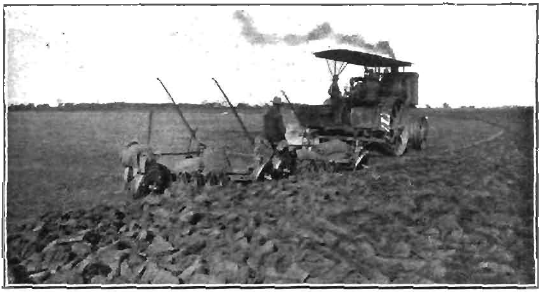
As has been mentioned, it is evident that at some period all this ground was under sea-water; for a shell deposit of varying depth underlies the silt everywhere. Below the shell is clay; above it is first light clean sand of 6 to 10 inches; then a heavy black loam of 4 to 6 inches; and then about the same depth of the brownish silt. This is the formation on the lower parts of the race-course land which have been under water on every occasion of flood. The shell here varies from 6 to 20 inches and more in depth; and in making the main effluent channel the shell taken out has been used to manure the larger portion of the 50-acre paddock near the shelter shed, being distributed at the rate of 60 loads to the acre. All through the surrounding district this shell is used by the farmers for manuring, its selling price being about 3d. per load in the pit. The black loam would appear to be formed by the gradual decomposing of the vegetable matter in the overlying silt; and after draining, when turned over and worked, it breaks down as free as could be desired.

Drainage, Irrigation, and Cultivation.

Prior to beginning the work of draining on Sparrovale samples of the soil were submitted to analysis, and salt was found to be present to such an extent that doubts were expressed as to the land proving suitable

for general cultivation. As the draining work proceeded, a strong growth of strawberry clover made its appearance; and now, when protected from stock, bids fair to smother the rough grass that was the principal growth on this land previously. When this drained ground is broken up, rye grass and other common forage grasses make their appearance.

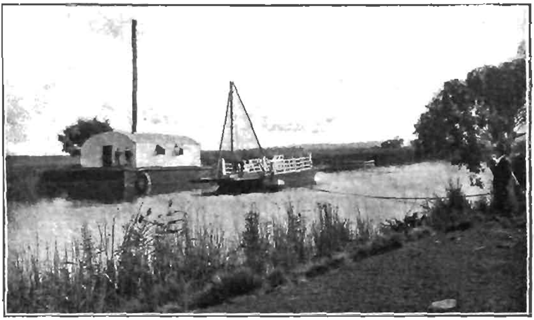
The growth made by the clover after draining encouraged the sowing of a trial crop of maize. In the paddock chosen, near the river bank, where the land is slightly higher, was a 20-acre strip of lignum—a dense wiry bush, growing up to 10 feet high, and with about the same spread, and close to the ground. This scrub forms a perfect harbor for rabbits at all times; for, as they scramble to the higher parts of it as the water rises, only a very high flood can destroy them. The clearing of this lignum belt was effected by first breaking down the bushes with a "Mallee-roller" made from a large iron boiler hauled by eight span of bullocks; and then grubbing out the roots. By this method the land was made ready for the plough at a cost of something less than £2 per acre, most of which was spent on feeding the bullocks, there being literally no grass to support them. This and 60 acres adjoining were broken up in October



STEAM PLOUGHING.

and November last by traction engine with two five-furrow disc ploughs, which had to be weighted with about a ton of wire to get them down to the work. In one of the accompanying illustrations the engine is shown at work. It was then disc-harrowed, harrowed, rolled, and harrowed again, and left till after the rain in December. It was then further worked; and in January was sown with maize in drills 21 and 28 inches apart, using 1½ bushels of seed per acre, and no manure. About a quarter of this was sown with Ninety Day maize in the expectation of getting a quicker growth; but the White Horse Tooth maize on the rest of the paddock grew as quickly, and made better stalk. When the crop showed through the ground the cultivators were put on, and a second working was given about two weeks later; but the rows were too close to allow of further working. About four weeks after the second working the crop was about 18 inches high and looking very wilted, and the ground was then flooded with water from the river, and a second flooding was given about four weeks later. The growth resulted in a crop varying from 3 feet to 7 feet high, with a probable average of about 4½ feet, and an

estimated yield of about 7 tons to the acre. The cutting of the crop was done with both the ordinary binder and a patent maize harvester. A photograph of the latter in operation is reproduced in this article. This machine is specially adapted for cutting drilled crops, being equal to any



IRRIGATION PUMPING PLANT AND FARM FERRY.

thickness or length of stalk. The several illustrations of the maize crop show it to be more even than the figures mentioned would suggest; but the variation in height applies more to the length of the individual stalks over the whole area than to the total growth on any given section. From some cause, on about 5 acres of the lowest-lying portion of the paddock the bulk of the maize failed to grow; but the scattered stalks that came some 3 or 4 feet apart, made the strongest growth on the field. The draining of this paddock was done as it is intended to do the whole

MAIZE CROP SHOWING TEMPORARY IRRIGATION CHANNEL.

of the farm flats, viz., by 4-inch earthen piping every 5 chains running to a 9-inch pipe along the sides, which in turn runs to an open drain lower down; and the cost of the work is given as at about £5 per acre.

Irrigating was done from the river through large open channels, with breaks made every chain till the whole was flooded. One of these channels is shown on page 499, and on the rising ground in the distance the homestead can be faintly seen. The pumping plant consists of a 130 b.-p. marine engine and boiler, driving a pump that delivers 6,000 gallons per minute. This is erected on a large barge moored in the river; and can thus be moved up or down the water-way by motor launch as required. With regard to the soil, the opinion is that much of the salt which the analysis showed to be present in it was carried away by the water in draining, and each subsequent flooding further assisted in this. The appearance of the maize before it was first flooded is said to support this suggestion, it apparently not being the ordinary wilting that follows lack of moisture; and it is thought that at this stage the roots had penetrated sufficiently deep to reach the salt below, and this the subsequent floodings leached out. Whether this theory is correct or not, the result at least is that from a 65-acre paddock of salty ground growing a rough grass of little feeding value there has been harvested something like 550 tons of green maize without any manuring; and on appearance that land now can be classed as equal to anything in the district, which is saying a lot.

CUTTING MAIZE WITH SPECIAL MAIZE CUTTER.

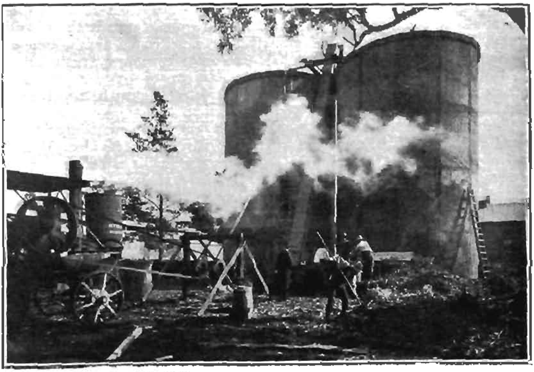
The water from this and all the rest of this 600 acres is to be carried to the river bank by the main effluent drain that runs along the south side of this area. This channel at time of writing was not completed, the teams being at work on it. The road-making machine, or grader, was used to remove the lighter material from the top, and the plough and scoop for the clay below. At the point where this channel reaches the river, a flood-gate is fixed, which will lift with a heavy flow of water from the land side, but is held closed by the river water. Near to the flood-gate, a well is sunk beside the channel, and into which it drains; and this is emptied by a 6-inch c.f. pump driven by a 6-h.p. oil engine. It is intended later on to provide for the removal of this drainage water as far as possible by wind power.

Above where the maize was growing, a 50-acre field of barley is showing well, and lower down the river a 60-acre block has been shut off from the

stock, and the clover is making good growth on it. As soon as the maize was in the silos the traction engine was at work again ploughing, and 50 acres are now ready for oats. The clover is showing up over all the

CARTING IN THE MAIZE CROP.

drained land; but owing to the stock, it can make no headway. Among other crops, this season it is intended to make a trial of a few acres of lucerne which, if it can be grown, would be the crop most suited for the conditions prevailing.



CONCRETE SILOS, MAIZE CUTTER, AND ELEVATOR.

A pontoon bridge is moored on the river above the pumping plant to convey stock across, as there is no possible crossing below the old breakwater some 2½ miles up. As previously mentioned, this breakwater was built 67 years ago to stop the tidal flow, which then kept the river water

brackish as far as the falls above the present Queen's Park, some 5 miles higher up; the river at that time being the water supply for Geelong. During the dry summer of 1893, the district residents secured a temporary breakwater on Reedy Lake below Sparrovale, as the river had got very low, and the water was too brackish for stock; and this construction has now been further strengthened by the Trust. About opposite this point is the northern boundary of Lake View, one of the purchased properties. This is practically all high ground of good farming quality, the greater portion of which has been cultivated, and the crops now are showing well on it. This property lies between Reedy Lake and Lake Connewarre, and was purchased in order to have some high land adjacent, from which to work these two swampy areas. Between two high necks of land below the Lake View property, and at the junction of the Reedy and Connewarre Lakes, the river has been sounded to 30 feet. From this, Connewarre opens out to a large sheet of shallow water, a haunt of wild fowl and a spawning ground for sea fish; and down the river, to the sandhills near Barwon Heads, lies Salt Marsh, Murtnagurt, and Riverland, which make up the balance of this 10,000-acre drainage and irrigation scheme that the Geelong Harbor Trust has thus methodically entered upon.

Reviewing the foregoing, the most noticeable point in connexion with the work is the bearing which its successful carrying out must have on the future of the surrounding district. The bulk of this area has never been of any obvious value, except to those few individuals whose knowledge of the locality enabled them to turn some portion of it more or less to their own private use; and none of these appear to have derived much benefit from it; but this scheme which is now well started, should eventually raise the earning power of the greater portion of it from absolute insignificance to an equality with that of the most favored farms in the district; turning thousands of acres of mud flats into cultivated fields, and circulating a weekly sum in wages far exceeding its former yearly return. Even at this early date, Sparrovale has been raised from a temporary grazing area to a high class agricultural estate, and must be an object of deep interest to all concerned in land reclamation.

The ultimate success of the whole undertaking can be confidently forecasted and with it will come the triumph of Mr. G. F. Holden, M.L.A., Chairman of the Geelong Harbor Trust, who, with his associate members (Messrs. E. H. Lascelles and J. Hill) has been responsible for the conception and elaboration of a scheme whereby the original endowment of the Trust instead of being allowed to lie fallow, may be increased many fold, and whereby also the economic potentiality of many thousands of acres of apparently useless land may be demonstrated.

MERINO RAMS.

H. W. Ham, Sheep Expert.

The establishment and further growth of the export lamb and mutton trade will bring about the substantial improvement and maintenance of pure merino flocks. The longwool merino cross will be from now, for general purposes, the class of sheep most in demand, and to produce profitable crossbreds, the better classes of merinoes must remain the foundation stock.

Where practicable, one of the most profitable ways of working fair sized estates is in breeding all high class merino ewes to best merino rams, and second class merino ewes to good shaped longwool rams. From the better class of ewes in these flocks will our flock merino rams be produced. In the future, these rams will be required principally by graziers who depend on good seasons and natural pasture for their export lambs, and who must make wool production an equal consideration, especially when breeding from coarse crossbred ewes. A merino breeder must of course still make quantity and quality of wool his chief aim, but there will always be the freezing trade influence through the crossbreds to be considered; this was not so in the past. Most of our merinoes are lean forequartered and do not freeze a good colour, but it is possible to gradually improve the shape of them and not affect wool production. Those of the level shouldered round class thrive the best.

For early lambing purposes, merinoes and fine comebacks are necessary, and where their lambs are intended for export we must consider shape, not solely because the export trade prefers it, but as lambs (everything else being equal) they come to the required weights in quicker time. This being so the merino rams to be used should be as far removed from the flat sided type as possible.

The general demand at present is for size, but without constitutional shape—mere size of carcass is not sufficient indication, especially of a sire. One argument used in favour of tall slab sided rams is that, if they had not ability to thrive, they would not have grown to the size The size, however, is due to specially favorable conditions of health and pasture. Keep on with sires of this shape, especially to ewes of the same shape, and see what the end in any district will be; the more unhealthy and cold the district, the sooner will evil results be seen. This shape is in the wrong direction; a breeder may at times be obliged to use rams rather weak this way, but in the main our chief breeders are fully alive to the advantages of what they term constitutional shape. To the average sheep breeder, weak forequartered rams in full wool are perhaps not so easily detected, and a few prominent folds behind the forearm may give the false impression of fullness of girth. Length and bulk of staple give the appearance of width of frame and level shoulders, but by comparison and handling this can easily be detected.

In heavy rain, our long stapled merinoes approaching comeback type get beaten down on the back, giving them a level appearance, which is often deceiving. For coarse ewes for lamb raising, this class, when level made, produces good lambs.

When rams are in low condition, they should handle even, that is, be no higher and sharper on the top of the shoulder than on the hips; to detect this in poor sheep close observation is necessary. A correct idea as to weak neck and light forequarters can be formed by standing over them. Even covering of fleece is closely dependent on formation, and shortness of leg. Thin and wasty forearms, openness and wastiness on top of shoulders, dry yolky patches, devil's grip, &c., are mainly due to variations in thickness of the flesh overlying the bony portions, or in other words, to the bony portions being, in places, immediately under the skin.

(To be continued.)

DISEASES OF THE SKIN.

(*Continued from page 448.*)

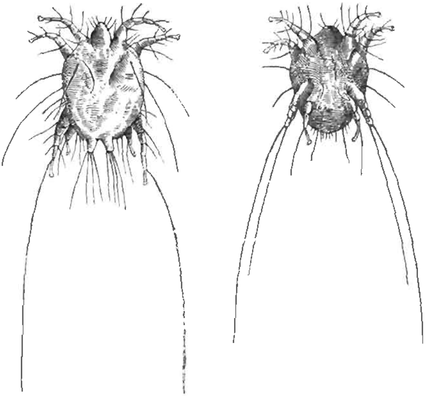
S. S. Cameron, M.R.C.V.S., Chief Veterinary Officer.

II. PARASITIC SKIN DISEASES.

I.—Animal Parasites (*continued*).

Mange or Scabies.

Mange in a comprehensive sense may be defined as an inflammatory skin disease caused by the presence in or on the skin of parasitic dermatozoa of various kinds. All species of domestic animals and many wild species become affected with mange—not however all caused by the same insects; for although different species of insect may affect one species of animal every animal has nevertheless a proneness to be affected by a particular mange insect—thus the horse is most severely affected with *sarcoptes scabiei*, cattle with *psoroptes communis*, sheep with *scabies symbiotes ovis*, dogs with *symbiotes canis*, cats with *sarcoptes minor* and pigs with *sarcoptes squamiferous*.



MANGE INSECTS.

There are three principal groups of mange parasites viz.:—

(1.) *Sarcoptes* which have their habitat in the deeper layers of the skin of the neck and trunk.

(2.) *Psoroptes* which are on the surface and invade principally the region of the mane and tail.

(3.) *Symbiotes* which attack the lower parts of the limbs and extend upwards towards the trunk.

There are many sub-classes of these causing various forms of mange in different animals but a description of the mange caused by the above groups in the horse and dog will serve to illustrate the nature of the disease in other animals as well.

Sarcoptic Mange.—This commences generally in the region of the withers from which it may spread to all parts of the trunk. The punctures of the parasite when it first attacks the skin cause an eruption of small pimples filled with serum that soon dries up and forms a dry crust, which scales off in the course of a few days leaving a raw moist surface. Before this exfoliation occurs the female parasite has usually burrowed a canal into the depths of the skin in which the eggs are laid. By the coalescence of the primary pimple spots considerable areas may be affected, and when the disease has become established the skin is thickened and thrown into folds or wrinkles which are denuded of hair and are covered with a thick scurf. The itchiness is intense.

Sarcoptic mange is very contagious, brief contact with infested clothing, bedding, brushes and such like being sufficient to cause its transmission to a healthy subject. The insect will live for about a month when removed from the horse so that to be on the safe side an infected stable should not be used for that length of time.

Psoroptic Mange usually commences in either the mane or tail spreading thence to the neck and jaws or thighs and quarters as the case may be, but the spread is not rapid. Papules or blisters are first formed amid the roots of the long hair. The bursting of these is accompanied by a discharge of serum and pus which continues and maintains the moistness of the affected parts by which this form of mange is distinguished from the sarcoptic. The psoroptic insects do not burrow but remain on the surface of the skin living on the exudation from the blisters. The skin ultimately becomes covered with sores, thickened, wrinkled and devoid of hair so that in the case of the tail being affected a "rat tail" results. Psoroptic mange is by no means so quickly contagious as the sarcoptic form.

Symbiotic Mange is practically confined to the limbs, commencing usually in the hollow of the pastern and rarely going higher than the knee and hock. The hind limbs are more often affected than the fore and coarse hairy-legged horses are more prone. There is at first great itchiness manifested by stamping almost continuously. Later on cracks and sores form and the skin becomes thickened and encrusted. Symbiotic mange is much milder both in its local effects and its contagiousness than the other two forms.

TREATMENT.—None of the forms of mange shows any tendency to spontaneous recovery. The predominant object in treatment is the destruction of the parasite both those living and those to be hatched from the eggs, for it seems to be impossible to destroy the vitality of the eggs by any known application that would not be dangerous to the horse. For the latter purpose intermittent treatment is necessary at intervals of three days for about a fortnight so as to cover the period of incubation or hatching of the eggs, which is about ten days.

Before applying any dressing the hair should be clipped (this is especially necessary in long coated dogs) and the skin washed with strong soap and water until the scabs and scurf are cleaned off. The use of a scrubbing brush and currycomb may be necessary to effect thorough removal of the scurf but it is essential that it should be done, otherwise the dressing

will have little chance of coming in contact with the parasites. For psoroptic and symbiotic mange the best dressing is a sulphur ointment (sulphur 1 part and lard 3 parts) which acts almost as a specific. A more lethal dressing is required for sarcoptic mange and any of the following prescriptions may be used changing from one to the other if the disease proves intractable. The oily dressings appear to penetrate better and are therefore more effective:—

(1) Kerosene, 2 parts.
Linseed oil, 1 part.
Soap solution, 2 parts.

(2) Creosote, 1 part.
Linseed oil, 20 parts.
Soap solution, 30 parts.

(3) Creosote, ½ ounce.
Methylated spirit, 5 ounces.
Water, 14 ounces.

(4) Carbolic acid, ½ ounce.
Oil of turpentine, 1 ounce.
Oil of tar, 1½ ounces.
Sulphur, 2 ounces.
Linseed oil to make a pint.

Decoction of tobacco (1 ounce boiled in a pint of water) and lysol or creolin solution (1 ounce to a pint of water) may also be used. Affected horses should be strictly isolated and disinfection of the stable, bedding, clothing and other stable gear should be thoroughly carried out.

GROWING MAIZE AND PUMPKINS FOR FODDER

The following particulars relative to growing maize and pumpkins for fodder at Eskdale have been extracted from a report recently furnished by Mr. P. J. Molan of the Government Cool Stores.

Duncan Bros.' Farm.—At this farm I saw 36 cows on 8 acres of pumpkins and the owners said that they had been there for eight weeks and would have sufficient food for seven weeks longer; yet hundreds of our best dairy cows are dead or dying of starvation although similar results are within the reach of nearly all the dairymen in the State. A fine lot of Berkshire and Yorkshire pigs, fed on pumpkins and maize in the cob, is reared here.

Tobin Bros.' Farm.—This farm is, undoubtedly, a long way ahead of any I have seen in this quarter—fine herds, good milking sheds, milking machine, and two 60 ton silos, full of nice fresh succulent ensilage, alongside the sheds. Two magnificent crops of maize were grown and were sown with the Automatic Yankee Planter, 3 feet one way, 3 ft. 6 in. the other and straight every way to allow of cross cultivation. The maize grew to about 9 feet high. Three varieties of pumpkins are grown, and the cows and sheep do well on them. The Berkshire pigs are fed on pumpkins and maize in the cob and usually top the Melbourne market. The comparison between the stock in this and other districts is a very striking one; at Eskdale all the stock are rolling fat.

GARDEN NOTES.

J. Cronin, Principal, School of Horticulture, Burnley.

Palms.

Palms constitute a large order of plants most of which are distributed throughout the tropical and sub-tropical portions of the globe; only a few kinds occur in temperate regions. A few very important kinds from a horticultural point of view are natives of Australia and islands adjacent, Lord Howe's Island being the home of a small genus comprising two species that are probably cultivated to a greater extent than any other decorative type of plants known. In their native habitats many palms attain a great height, while others are dwarf in stature; some kinds produce leaves fully thirty feet in length, while in others the leaves are only a few inches long. The form of the leaves varies greatly; in some species the leaves are fan shaped, in others feathery, but in almost all cases they are extremely beautiful and graceful. The fruits of the various groups also exhibit great variation; in some kinds it is small and borne in bunches, resembling grapes, and in others large and borne singly, as in the case of the cocoa-nut. Palms are of immense economic importance in tropical countries, providing the inhabitants with the greater portion of their needs in shelter and food, a familiar example of the produce of certain kinds being the well known sago of commerce; but it is on account of their great beauty as decorative plants that they are cultivated in all civilized countries.

In this State many palms have proved to be sufficiently hardy to justify their being planted in quantity in gardens. One of the most noteworthy is the Thread palm, *Washingtonia filifera*, (*Brahea*), a native of California, that succeeds splendidly in the Northern districts where the summer temperature frequently exceeds 100 degrees in the shade, resisting alike the influences of the great heat and fierce hot winds of summer, and the severe cold weather with heavy frost that commonly occurs during winter. A fine collection of palms, including many genera and species that are not usually cultivated except under glass or shade house conditions, is grown at the Melbourne Botanic Gardens. Splendid specimens of many kinds have developed during the past few years, and are a source of attraction to thousands of visitors at all seasons. Generally, the palms cultivated as outdoor garden plants in Victoria are limited to a few genera, such as the date palms, *Phœnix*, and the fan palms, *Trachycarpus* and *Washingtonia*, but it is probable that many other genera will be added in the near future, when it is found that their cultivation is much easier than is commonly considered. As pot plants for glass and shade house, room, and table decoration, an immense number of palms, running into hundreds of thousands, are raised and sold annually by Victorian nurserymen, the most popular kind being *Howea* (*Kentia*) *Forsteriana*, a native of Lord Howe's Island.

Suitable Soil Conditions.

A well drained and fairly porous loam is the most suitable soil for palms. A few of the hardier kinds will thrive in almost any kind of soil from a light sandy to a stiff clay, if the drainage is good and a little care is taken of the young plants until fairly established. There

is usually a common cause that accounts for the failure of certain plants to succeed under what appear to be suitable conditions. In the case of many kinds of palms the cause of failure is a liberal use of fermenting manures. Anything tending in that direction is unnecessary to healthy development, is almost certain to check, and in many cases, kills the plants outright. The addition of sand, leaf mould, and well decayed

THE HEMP OR FAN PALM.
Trachycarpus excelsus, syn. Chamærops excelsa.

cow manure is beneficial, if the soil is very heavy and tenacious; or if very light and sandy, the addition of strong loam or clay and well rotted cow manure thoroughly mixed with the soil is necessary.

FAVORABLE SITUATIONS AND PLANTING.

A position fairly sheltered from strong winds, unshaded, and beyond the starving influence of large trees such as pines is suitable for a number of kinds that are of special value as specimen plants, either planted singly on lawns, or grouped to produce sub-tropical landscape effect. In large gardens several kinds of varying type of foliage and habit of

growth may be planted when the situation is favorable. Sufficient room should be allotted to each plant, to insure full development without crowding. Plants of a temporary character may be grown near palms for several years, if care be taken that the permanent plants are not injured by deprivation of moisture and food, or distorted by exclusion of light and air.

THE CANARY ISLAND DATE PALM.

Phœnix Canariensis.

Pot grown plants that have not been allowed to become root-bound should always be selected. Such plants, if carefully planted in well prepared and suitable soil, will make rapid and healthy growth even though they are small. Larger plants are available in many nurseries where they are grown in beds, but the removal of such plants is always attended with a deal of risk. One or two kinds may be lifted safely, but in the majority of cases the roots that are damaged die back and the plants receive a very severe check from which they never entirely recover.

Spring is the best season to plant. When the plants are removed from the pots the drainage should be taken away, the roots carefully disentangled, if necessary, without breaking the ball of soil; the roots

should then be carefully spread and covered with fine soil, and the soil firmly pressed or trodden around the ball as taken from the pot. The most important point in regard to planting is that the plants must be set out *at the settled level of the surface.* To plant too deeply is to court failure. The soil should be kept in a moderately moist condition at all seasons, and the plants shaded during the first summer, especially if they have been grown in bush houses or frames in the nursery where they were raised, the usual condition of their nursery culture.

Palms are propagated from seeds. The seeds in many instances require a long time to germinate and the young plants require frame treatment and careful handling. Very few plants will be needed in an ordinary garden and it is better to buy them from a reputable nurseryman than to attempt to propagate and grow them to a size fit to plant in the garden.

Selection of Kinds.

Trachycarpus excelsus, *Chamærops excelsa* of most nurserymen, is the hardiest of all. It attains a height of 15 or 20 feet and requires about 12 feet of head room when fairly developed. This palm may be planted in any district in Victoria with a good prospect of success. It is a fan leaved palm, and is suitable for pot culture.

Chamærops humilis is a dwarf hardy fan palm, suitable for small gardens. It is not a good subject for pot culture.

Washington filifera, syn. *Brahea filamentosa*, is most suitable for planting in hot districts. It is one of the finest of the order, attaining a height of 15 or 20 feet and a head spread of 15 feet when well grown, the leaves being large and fan shaped.

Livistona australis is also a large palm of the same class, but is not comparable with the last named kind as a hardy enduring plant. It suffers greatly from hot dry winds, and requires a deal of shelter.

Phœnix canariensis is a magnificent kind. Many plants in various parts of Victoria have attained a height of 25 feet with a head spread of 30 feet. The leaves are long, gracefully curved and plume like, the plant fairly hardy and very vigorous. The common date palm, *Phœnix dactylifera*, is easily raised from seeds and is very hardy. Other species of Phœnix that thrive well about Melbourne are *P. sylvestris*, *reclinata*, *spinosa*, and *rupicola*, the latter being the best species for pot culture.

Diplothemium maritimum and *D. campestre* are splendid kinds worthy of trial in any garden. They thrive in the coastal districts but may fail in the interior. They attain a large size, specimens at Melbourne Botanic Gardens being 15 feet in height and 20 feet across.

Other palms that would probably require more shelter than those mentioned, and are worthy of a place anywhere are:—*Cocos, plumosa* and *flexuosa; Ptychosperma elegans; Areca Baueri* and *sapida* and *Howea (Kentia) Forsteriana* and *Belmoreana.*

Flower Garden.

The work of digging, pruning, and planting deciduous subjects should be completed as soon as possible, especially in districts where the weather becomes dry and warm early in spring. Generally it is well to be somewhat ahead with such work, so that in the limited time usually devoted to the flower garden certain necessary tasks can be completed in due season. Soil will need to be brought to a condition suitable for sowing

seeds, and planting annuals, herbaceous plants, and summer-flowering bulbs early in spring; the proper state cannot be easily produced, unless the digging has been completed and the soil subjected to the ameliorating influences of weather for some little time. The reduction of the general rough winter surface to the smooth and pulverised summer tilth should also be done before the rough soil becomes hard and a deal of the soil moisture is lost. Weeds will be accounted for in the process.

Plants that require to be staked and trained should have attention early. Vigorous growth, qualified to produce the finest possible flowering, cannot be produced on plants that are permitted to creep or trail in a more or less entangled mass at angles of great weakness. Under such conditions an early, short-lived, and unsatisfactory flowering will probably result, even if care has been taken in soil preparation, &c.

Sweet peas should be supplied with the means to grow erect as soon as the plants are a few inches high. The usual plan adopted is to place small cuttings of trees or shrubs for the young plants to climb on as soon as tendrils are noticed, and later on, as need arises, the taller stakes are placed for the development of the growths. Healthy strong growth must always precede an abundant and fine display of flowers on plants of this class. Carnations need to be staked as soon as the flower shoots begin to develop, but prior to that the plants should be trained so that the tying of the flower shoots to stakes is an easy matter. A light dressing of a complete manure, applied to the surface and lightly hoed in, will be of great benefit to plants that will produce their blooms during the next three or four months.

Seeds of hardy annuals may be sown in the open ground, or in boxes for transplanting later. Seeds of tender kinds, if plants are wanted early, should be sown in a frame or shelter that will keep frost out. The soil in all cases should be in a moderately moist condition, finely pulverised and free, to obtain successful results. Richardias, gladioli, and other bulbous plants that flower during early summer may be set out.

Kitchen Garden.

The soil should be in readiness for the reception of various crops of vegetables for summer use. Seeds of a number of kinds may be sown, according to the soil, climatic conditions, and family requirements, including onions, carrots, broad beans, peas, beet, cabbage and cauliflower, and various saladings. Onions may be transplanted.

Where a hot-bed frame is available seeds of celery, tomatoes, and the melon family may be sown. Potatoes may be planted.

THE ORCHARD.

James Lang, Harcourt.

The weather has been all that could be desired during the past month, and has facilitated planting operations which should be completed by the end of August. Late planted trees, as a rule, do not succeed so well as those planted earlier in the season, especially so should the spring turn out to be dry and warm.

Pruning should also be completed by the end of the month. Old trees that show signs of weakness through the fruit becoming small and

unprofitable may be headed well back; if the roots are healthy, a strong and vigorous growth will take place, and thus renew the life of the tree for many years, or a different variety may be grafted on, if desired.

During the past dry summer fruit trees have suffered a good deal from the ravages of the red spider; this little pest seems to revel in the conditions which prevailed. Most trees showed the effects of the myriads of insects sucking at the leaves, causing them to turn a sickly pale yellow, and fall prematurely. The pest has now taken up its winter quarters on the under side of the fruit spurs and small branches, where it shows a dull brick-red colour, and unless dislodged and destroyed it will very materially affect next season's crop of fruit. The best remedies to destroy this pest are emulsions of kerosene, red oil, or crude petroleum, all being equally effective.

The method of preparing the emulsion is as follows:—Put two gallons of water in a boiler with 2 lbs. soap, let the water boil, and then pour it into a small bucket spray pump, with two gallons of oil; pump quickly with the nozzle turned into the bucket for a few minutes and a complete emulsion is formed. This can now be diluted to any strength required —one part of the emulsion to twenty of water is the strength generally used. Many growers put the two gallons of oil into the boiling soapy water and stir quickly for a few minutes; by adopting this method of preparation, there is always the danger, through a complete emulsion not having been formed, of any free oil floating to the top, when allowed to stand for a short time. When put through the spray pump, this free oil is the last to be sprayed, and causes great damage to the trees, sometimes killing them outright. It is therefore much better and safer in making the emulsion, to use a small force pump for the purpose. When it gets cold, a properly made emulsion forms a jelly without a trace of oil, and can be used at any time during winter without danger to the trees.

These sprays are also effective in destroying the mussel and San Jose scales. They are more effective when a good pressure is maintained in working the pump, as the spray strikes the tree with considerable force, and penetrates all the crevices and inequalities of the bark where the pests are harboring.

Apple trees affected with the woolly aphis should be gone over, and the affected parts dressed with the potash and sulphur remedy given in the February 1907 number of the *Journal*. Black aphis on the peach trees will also require attention; the old remedy, soft soap and tobacco, or kerosene emulsion, will prove effective in destroying this pest. The trees require frequent spraying to keep the aphis in check.

It is surprising how few orchardists grow table grapes, even for their own use. There is nothing more refreshing in the summer time than a bunch of grapes, and every orchard should contain a small plot. The best varieties to grow are specified in the following lists:—

COLD DISTRICTS.

White.—Early White Malvasia, Golden Chasselas, Sweetwater.

Black.—Blue Imperial, Black Hamburgh, Muscat Hamburgh.

WARM DISTRICTS.

White.—Golden Chasselas, Caracosa, White Morillon, Raisin des Dames, Waltham Cross, Centennial, Doradilla, Muscat of Alexandria.

Black.—Black Hamburgh, Muscat Hamburgh, Red Prince, Mammoth, Gros Colman, Madresfield Court Black Muscat, Wortley Hall.

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DISEASES OF THE SKIN.

(*Continued from page 500.*)

S. S. Cameron, M.R.C.V.S., Chief Veterinary Officer.

II. PARASITIC SKIN DISEASES.

I.—ANIMAL PARASITES (*continued*).

Acne.

Acne (Gr. Akis=a point) is a disease affecting the sebaceous follicles and caused by the presence in the follicle of a minute animal parasite—(*Demodex folliculorum*)—from 1-50th to 1-500th of an inch in breadth. The disease affects dogs and pigs principally, and is identical with the affection of the skin of the nose and face of man called "blackheads" or comedones. The pig is usually affected on those parts of the skin which come in contact with the filth of the stye—the claws, legs and snout—but in severe cases the whole surface of the body may be affected. The affected skin is covered with pimples which appear to contain pus, but an examination, the yellow greasy and foul smelling content is found to be simply sebaceous matter which has been formed in excess on account of the irritation of the parasite and has caused great distension of the follicle giving it a pustular appearance (see illustration on the following page).

TREATMENT.—The affected parts should be washed with a solution of soda and then a mixture of creosote 1 part, liquor potassæ 4 parts, and olive oil 16 parts, should be applied with smart friction. This treatment should be repeated at intervals of a week.

II.—VEGETABLE PARASITES.

RINGWORM—PRURIGO, QUEENSLAND MANGE.

Ringworm.

Ringworm affects cattle most frequently. The disease is sometimes seen on horses, occasionally on dogs and cats, but seldom if ever on sheep. It is transmissible from cattle to man. No matter the class of animal the cause is the same, viz., a skin fungus or parasite (*Trichophyton tonsurous*)

ACNE OF PIG.

RINGWORM.

which establishes itself at the roots of the hair and causes an exudation of *serum* and cells which when dry forms a scurf. The greyish scurf becomes thicker, the hairs through malnutrition break off at their base, and the skin becomes bare, roughened, and scaly in patches of varying size.

These patches, at first small and circular, enlarge by extension in an ever increasing radius from the original point of infection until they are upwards of 2 inches in diameter when they may coalesce with another adjacent patch and so form large irregular shaped areas.

Animals in low thriftless condition and young stock—calves and yearlings—are most prone to attack and the affection never takes very serious hold of well conditioned mature animals. The affection usually appears first on the head and neck, the eyelids, nose and base of ears being the most common seats, but it may spread from there to the root of the tail and other parts of the body.

Treatment.—Ringworm is not difficult to cure if, along with the local treatment, an improved diet, and greater attention to skin cleanliness and grooming are given. A pint of boiled linseed jelly is a useful addition to the daily feed while the calves are undergoing treatment. The best local treatment is the daily application of an oleaginous paraciticide ointment after the scurf has been removed by means of scrubbing with soft soap and scraping with a spoon or blunt knife. This removal of the scurf is essential to success for otherwise the ointment has no chance of coming in contact with the living fungus causing the disease. Two of best ringworm ointments are red mercury (binidide) ointment or blue mercurial ointment, which may be applied on alternate days, but they are both highly poisonous and therefore require exceptional care in use. Milder and scarcely less effective applications are :—

(*a*) Lard, 5 parts; Iod., 1 part. (*b*) Soft soap, 5 parts; Sulph., 1 part. (*c*) Glycerine, 3 parts; Sulphuric acid, 1 part. (*d*) Glycerine, 3 parts; Acetic acid, 1 part.

The ointment should be well rubbed in and the parts should always be washed before a second application. The disease is contagious and, as will be readily understood, the walls fences posts woodwork and floors of the pens and paddocks are easily contaminated and may remain a source of contagion for months so that the disease will continue to be troublesome unless effective measures for the disinfection of pens are thoroughly carried out. Cleansing with carbolic solution and hot limewashing are most likely to be effective to this end.

Queensland Mange.

In 1888 Mr. Ed. Stanley, F.R.C.V.S., Government Veterinarian for New South Wales, investigated a contagious form of skin disease then prevalent in Queensland and the Northern Districts of New South Wales, which has hitherto been known as Queensland Mange but which he designated as a contagious prurigo. In response to a request from me Mr. Stanley very kindly placed his excellent report on the disease at my disposal and from the extracts which I now quote a good idea of the nature of the disease may be gained. He says :—

"This disease appears to have been known in the North for several years, and to have attracted attention early in 1887, in consequence of spreading through the colony; this was during the prevalence of heavy rains, and the disease disappeared with the cold weather. Last summer it reappeared, and extended principally through the coast districts, extending into New South Wales, so that now it is more widely spread and more severe in character than was ever remembered before. It is a disease of the

skin, that would be better named prurigo, meaning 'to itch.' The term mange is applied to another disease in horses and dogs, caused by acari, to which it bears a closer resemblance.

"This prurigo is characterised by an eruption of small scattered itching nodules, loss of hair from the withers, back, loins, and croup; later on the head, mane, and tail are also involved. It is of a contagious nature and its progress depends very much on the surroundings and susceptibility of the animal exposed to attack. In some places not one horse escapes, in others the disease spreads slowly and a large percentage enjoys immunity. two horses may work together, one suffers and the other escapes; one attack does not prevent a recurrence of the disease. This disease is not caused by the horse mite (*Acari psoroptes*), but is apparently due to the presence of a vegetoid parasite of a microscopic fongi order which finds proper nourishment on the skin, and by rapid spore formation and growth, penetrates the hair follicles and perspiratory ducts. Being a foreign material, it sets up irritation in the periphery nerves, interrupting and perverting the functions of the skin, exciting itching and inflammation, with an extraordinary accumulation of scurf and effete products."

After recording his observance of an allied skin affection in cattle Mr. Stanley proceeds:

"The symptoms are, first, a rash extending along the neck, withers, and back, to the tail, for about 18 in. on each side of the spine (not unlike mosquito bites). The spots are the size of a threepenny-piece, the hair is slightly raised, and the little swellings can be felt by passing the hand carefully over the parts. A day or two later, on the centre of some of these a little pimple is felt and a small scab, with five or six hairs adhering, is readily detached. The horse likes manipulation and moves his lips sympathetically. The itching is seen by a sore or two as large as a shilling on the back, where the horse has rubbed the skin with his teeth. Soon the hair stands erect on the withers and top of the spine, the skin begins to wrinkle, it is thickened by interstitial effusion. A large amount of scurf and loose hairs accumulates and the sores (caused by rubbing and biting each other) extend, vesicles form and break and their secretions make horny scales, which accumulate with the cuticular *débris*. The hair of the mane and tail is destroyed by rubbing, the skin of both thickens and corrugates; the hair soon falls in quantities from the wither and back, in consequence of the animal rolling, and in a week or two after the attack the parts are more or less bare of hair, and covered with a thick scaly scurf, with patchy sores, coated with exudation, blood, and dirt.

"The progress and termination of this disease are variable. Some entirely recover without treatment; change of feed, such as stabling grass horses, has a good effect; change of season, from warm moist summer weather to cold dry winter, appears sufficient to check the development of the parasitic fungus; it disappears in the winter months, and may, or may not, reappear on the same horse the following year.

"In its early stages and milder forms it is arrested by various applications, but when allowed to become chronic, intense pathological changes proceed; sore ears, ulcerations, and serious abscesses beneath the skin reduce the animal's condition, and make him unserviceable. The disease is not of itself fatal, but deaths have resulted from the injudicious use of irritating poisonous applications.

"To distinguish this disease from others is not easy, as it bears a remarkable resemblance to the itch, or horse mange; it differs, however,

in being much less contagious, and it does not attack the skin in isolated patches, or extend from the margins outwards to become confluent. Recoveries are spontaneous, without treatment; and last, the insect is absent.

"This prurigo is distinctly contagious, the medium being probably the fungoid parasitic cells, or spores. These are so minute that they readily float in the air, and are easily conveyed by one horse biting another, by the saddle cloths, harness, brushes, &c. The ears and head become infected by an animal biting his own back, and the reason of the upper surface of the body being first affected is that the spores settle as dust and fall through between the hairs on to the skin, being more likely to fall off the sides or limbs, or may be the excretions and accumulated *dèbris* on the skin in those parts is a more suitable soil for their growth, which once established soon penetrates the orifices and fissures of the skin. Such fungoid parasites are extremely minute, measuring from 1-3000 to 1-7000 of an inch, and are rapidly reproduced by proliferating cell growth called spores, or by thread-like bodies called mycelium; these invade the skin and produce the morbid changes, so disastrous to its structure. Susceptible horses show the disease about a week after contagion; in some it finds a suitable soil and makes rapid progress, in others it is altogether as slow, and it takes several months to run its course.

"Prevention.—Avoid every source of infection: keep the horse in health by cleanliness and good food, and wash with soap and water, or some simple dressing that is anti-parasitic, and sprinkle sulphur on the skin from time to time.

"Curative remedies will consist of anti-parasitic agents that will not injure the skin, so as to leave permanent blemishes. The skin of the horse is very sensitive to the action of turpentine and the mineral caustics; these should be avoided, as too irritating. In all cases cleanse the skin by thorough washing with soap and water, or soda and water, then apply agents containing sulphur, such as potassa sulphurata, lime and sulphur, hypo sulphite of soda, combined with water. Powdered sulphur mixed with grease as an ointment is a good dressing. Preparations of tar, such as watery solutions of carbolic acid, Little's dipping mixture, and Jey's carbolic fluid, are very convenient for use. There are several other agents, that may be equally useful, such as prussic acid, or sulphurous acid, mixed with glycerine and water. More important is the method of application than the agent that is used: the wash is to be diligently and thoroughly applied from the horse's nose to his tail, in fact, it would be best to swim him in a medicated bath.

"The clothing, saddles, harness, brushes, and even the stables will require fumigating with burning sulphur, or immersion in the dressing used for the horses. And as reinfection is liable to occur, a repetition of the application will be required twice or thrice a week in order to effect a cure.

"Constitutional treatment must not be lost sight of: change of feed, rock salt, and mineral tonics, that act specially on the skin, as antimony, arsenic, iron, &c., are most suitable. It is important to remember that one infected animal is a constant source of danger to others, so that isolation and segregation should be attended to; and, although it may be almost impossible to treat unbroken horses and cattle, still it will be necessary to check, if not to eradicate the disease, in working animals, as we cannot foresee the disastrous extent to which the disease may reach."

Shortly after Mr. Stanley's investigation Mr. Henry Tryoo the Queensland Government entomologist announced his discovery, in the cells of the cuticle in the hair follicles and in the hair of horses affected with Queensland mange, of an "exceedingly minute fungus occurring in immense

numbers," and he stated he had "succeeded in cultivating these vegetable parasites apart from the tissues in which they were found." I regret that I have been unable to lay hands on a more detailed description of Tryon's fungus as I imagine it to be identical with *Trichophyton epilans* which I have recently found associated with a contagious skin disease very prevalent in Victoria in 1903 and 1904 and to which reference will be made later on.

I also appealed to Mr. P. R. Gordon, late Chief Inspector of Stock, for information regarding Queensland mange and have pleasure in quoting from his courteous reply under date Feb. 26, 1904:—"The disease known as Queensland mange in horses has, I regret to say, not as yet been scientifically investigated. It occurred first here on the breaking up of the drought in 1884, and spread pretty well over the whole of Queensland. Mr. Ed. Stanley, F.R.C.V.S., was despatched from Sydney to report on it. He described it as being caused by a vegetoid parasite, and Mr. Henry Tryon, our entomologist, was of the same opinion. In no instance did it attack horses that were stabled and groomed, and in very few instances did it attack horses grazed in the open air by day but stabled at night. All sorts of nostrums were brought under notice for its treatment with varying results. I purchased a very badly affected horse for our benevolent asylum and treated merely by frequent washings with soft soap. The "mange" completely disappeared and it was sent to the institution at Dunwich, which is on Stradbroke Island, and although the disease reappeared in the horse the following autumn none of the other horses on the Island suffered. It is not contagious in the sense of being communicated from one animal to another, or by interchange of saddlery. I sent specimens to the Brown Institute for Dr. Burdon Sanderson, and the recommendation from that Institution was to exclude the air from the parasite (whatever it was) and whale oil came into general use in its treatment and was the most successful of any.

"It completely died out, but on the breaking up of the long drought last year (1903) it has again reappeared but not to the extent of the first outbreak."

Parasitic Eczema.

A contagious form of eczema became very prevalent in Victoria during 1903-4 the clinical symptoms of which, though less aggravated, very closely resemble those described by Stanley as Queensland mange. The aggravation of symptoms in some cases of the latter disease, I have thought may be due in part to the irritating influence of the sun's rays on an already irritated skin, which influence would be pronounced in tropical regions. It is significant also that the Victorian visitation occurred about the same time as the recrudescence of the disease in Queensland after the breaking of the drought as mentiond by Mr. Gordon. In the Victorian disease the croup and quarters are the parts most frequently first affected, and next to these the withers and sides of the neck. Attention is first attracted by the erection or standing on end of small tufts of hair, under which a nodulation of the skin can be distinctly felt. The raised hairs become deadened and fall off in a few days leaving a moist, bare and almost circular patch, at first scaly and with a slightly raised circumference but later on becoming dry, smooth and shiny. These patches vary in size from that of a three-penny-piece to a shilling, rarely becoming larger except by confluence of two adjoining patches. Microscopic examination shows that

the hairs are not broken off as in ordinary ringworm (*Trichophyton tonsurous*) but are shed from their follicles. The depilated hair roots are infested with spores and mycelium which, with a magnification of 500 diameters, resemble anthrax filaments from a culture, except that some appear to be branched. Taking into consideration the complete depilation which characterizes the affection I take it that the fungus is likely to be identical with the *Trichophyton epilans* described by Maguin. If this conclusion is correct the disease is a variety of ringworm—a true trichophytosis—but I have preferred the name of parasitic eczema as being more likely to convey its etiological and clinical nature.

The disease yields readily to germicidal treatment, a favorite and effective dressing of mine being a liniment composed of olive oil and water, of each 4 ounces, with 2 drams of carbonate of potass to emulsify and 1 dram of prussic acid as a germicide and local sedative to allay the itchiness.

It is significant, as tending to confirm the identity of this disease with Queensland mange, that the Victorian visitation occurred about the same time as the recrudescence of the disease in Queensland after the breaking of the drought, as mentioned in Mr. Gordon's letter. The clinical symptoms, course and termination of the two affections are so much alike that, also remembering Mr. Tyron's discovery of a vegetoid parasite associated in the latter disease, I am inclined to conclude that they are one and the same disease.

THE ELEMENTS OF ANIMAL PHYSIOLOGY.

(*Continued from page 352.*)

W. A. Osborne, M.B., D.Sc., Professor of Physiology and Histology, Dean of the Faculty of Agriculture in the University of Melbourne.

XII. The Circulation.

The blood could not carry out its functions unless it was circulating in a definite manner to and from the organs of the body. To affect this movement a muscular pumping organ, the heart, is found in the thorax between the two lungs and joined to the largest blood vessels of the body. The heart is in reality a double pump, the right and left portions having no communication with one another. In each half there is the thin-walled AURICLE, into which the blood is poured from the veins. The auricle in each case communicates with a chamber with more muscular walls called the VENTRICLE; the opening between the two being guarded by a valve so that the blood can pass from auricle to ventricle, but not in a reverse direction. This valve is formed by two flaps in the *left* half, and is called therefore the BICUSPID VALVE, or, from a fancied resemblance to a bishop's mitre, the MITRAL VALVE; but by three flaps in the *right* half, and called in consequence the TRICUSPID VALVE. Each valve flap is firmly attached at its base to the junction of auricle and ventricle and has the free end pointing towards the ventricle. These valve flaps are stayed with tendinous cords—CHORDÆ TENDINEÆ—which are fastened at one end to the edges of the flaps and at the other end to muscular outgrowths from the inner walls of the ventricle. Out of each ventricle proceeds an artery with tough fibrous walls. This opening

is also guarded on each side by a valve, but the arrangement of the flaps is different from that found in the mitral and tricuspid valves. Each of these valves is formed by three pouches, the free edge of each pouch pointing away from the ventricle. The shape of these pouches has given the name SEMILUNAR to these valves.

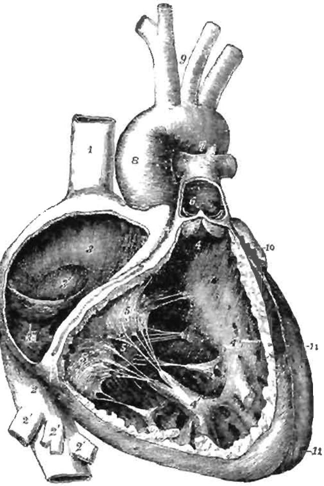


Fig. 50. The heart with the right auricle and right ventricle opened by dissection. 1, 2, venæ cavæ entering left auricle; 3, right auricle; 4^1, muscular pillar attached to chordæ tendineæ; 5, flaps of tricuspid valve; 4, semilunar valve guarding entrance to; 6, the pulmonary artery; 8, aorta; 10, portion of left auricle. (After Halliburton.)

The heart, as every one knows, beats rhythmically, that is, there is a period of muscular activity called *systole* followed by an interval of rest called *diastole*. The movements that take place in systole in a mammal are too quick for the eye to follow; but mechanical records of these changes, as well as comparison with the slower beating hearts of lower animals, allow us to give the following description:—Systole commences in the great veins, close to their junction with the auricle, and takes the form of a wave of muscular contraction rather suggesting a quick but imperfect peristalsis. When the wave reaches the auricle the thin walls of this chamber contract in a short quick "snap." Then the muscular wave passes through the connecting substance between auricle and ventricle and reaches the ventricle, which at once goes into powerful contraction. This sequence occurs on each side in the same manner and at the very same time. When the contraction of the ventricle is over the heart passes into diastole.

It is still a matter of debate whether this muscular rhythm is produced by a local nervous system residing in the heart, or is to be looked on as a property of the muscular substance itself. The nerves passing to the heart from the central nervous system may be severed without stoppage of the heart; the heart may even be cut out of the body, yet so long as its vessels are supplied with blood or a saline solution of the proper concentration, it will beat for many hours. Even certain portions of the heart, if isolated, will exhibit the same property. But the central nervous system, though it is not the cause of the beat, can certainly exercise some control over it. Two sets of nerve fibres pass into the heart. In the vagus nerve there are cranial autonomic fibres which can slow down the rate of the beat and also diminish the force of the ventricular contraction. The heart is normally under some vagus control, for if these nerves be cut the beat at once increases in strength and rate. Impulses can also pass down the vagus due to reflex action. Thus a blow on the stomach or wind-pipe, or an irritating gas getting into the upper air passages, will cause stimuli to be sent down to the heart slowing and weakening it. The other set of nerves is a supply of fibres from the thoracic autonomic or sympathetic system which has just the opposite action on the heart, namely, quickening the beat and strengthening the force. The increase in rate and strength of the heart beat during exertion, or accompanying fear, is due to sympathetic impulses as well as weakening of vagus control. The significance of the supply from the central nervous system is that the heart-beat may be altered to suit the requirements of the body generally. In exertion more blood is wanted in the muscles: in fear the heart automatically prepares for the muscular exertion of fighting or running away.

The rate of the heart beat varies in different animals, and in each animal with the age, being quicker in the young than in the adult. As averages for adult animals the following may be given:—

Horse	30—40	per minute.
Cow	40—50	,,
Sheep	60—80	,,
Man	70—80	,,
Dog	70—120	,,

In a man or a sheep, with the rate of 75 per minute, each beat will take up 0.8 of a second, of which time 0.4 is occupied with the systole and the remaining half with diastole.

At the height of systole the ventricle comes into contact with the chest wall, giving rise to the so-called APEX BEAT, which may often be seen and can usually be felt at the proper region in each animal. If the ear or a stethoscope be placed on the skin over the heart-region two sounds can be distinctly heard, one during, and one shortly after systole. The second sound is short and sharp, and is due to closure of the semilunar valves; the first sound is duller and more prolonged, and seems to be made up of more than one factor; but closure of the mitral and tricuspid valves and the contraction of the muscle of the ventricle are probably the chief causes.

We are now in a position to trace the circulation in detail, and we may begin with the veins entering the left auricle. These PULMONARY VEINS as they are called, come from the lung and carry bright-red arterial blood in a sluggish stream towards the auricle. The blood enters the auricle, fills it out, and passes through the mitral valve into the ventricle which it distends to a feeble extent, the flaps of the mitral valve floating up

so that their edges nearly meet. Then comes the systole. The contraction in the veins has little action, but the quick snap of the auricle empties this chamber, part of the blood passing back into the veins but the main part being driven into the ventricle. Then the ventricle contracts strongly; the walls approach one another and exert pressure on the blood between them. The mitral valve closes tightly, and the *chordæ tendineæ* being pulled on by the muscular pillars to which they are attached not only prevent the mitral valve from being driven into the auricle, but actually pull the whole valve and its attachment down into the ventricle, so that it may be said that the walls on every aspect of the ventricle approach each other in systole. Now out of the left ventricle arises the great artery of the body, the AORTA, and as the blood within it is under pressure the similunar valves are tightly closed. When, however, the pressure in the ventricle exceeds the pressure in the aorta, the semilunar valves open and blood is shot out of the ventricle into the great artery; then the ventricle stops, and at the same instant the semilunar valves close tightly

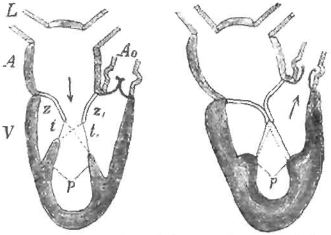


Fig. 51. Diagram to show action of heart valves. A, left auricle; V, left ventricle; Ao, aorta; P, muscular pillars attached to t, chordæ tendineæ; Z Z[1], flaps of mitral valve. In the diagram to the left the heart is in diastole; the mitral valve is open and the semilunar is shut. In the diagram to the right, the heart is in systole, the mitral valve is shut whilst the semilunar is open. (After Schultz.)

again. From the aorta arise the main arteries for supplying red arterial blood to the whole body. This great vessel soon after leaving the heart forms an arch and then passes lengthwise through the body. In its course it gives off numerous branches. The first branch is a tiny vessel for the heart itself; then come large arteries for the fore limbs and head; then small arteries for the walls of the body cavities; then as the aorta passes through the abdominal region a mighty system leads to the abdominal alimentary canal; then a pair of vessels to the kidneys; then arteries to the pelvic organs, the lower limbs and tail. All these arteries give off branches, and these again divide into smaller branches, and so on until minute ARTERIOLES of microscopic size are formed. As the calibre of each parent branch is less than the sum of the calibres of the smaller branches it gives rise to, the total cross-section of the arterial system gradually increases from the heart to the arterioles, and, in consequence, the rate of the blood stream gradually diminishes. A change in the structure of the walls may also be noted. The aorta and large arteries have walls which are rigid with fibrous tissue and have only a little "give." The smaller arteries have more elastic walls, whilst the arteriole walls are chiefly muscular, the muscles, by their contraction or relaxation, *constricting* or *dilating* the calibre of these vessels.

The blood throughout this arterial system is under pressure, and therefore, as it cannot escape from the aorta back again into the ventricle owing to the semilunar valves, it is forced through the arterioles, which are always more or less constricted, into the smallest vessels of the body or CAPILLARIES which form a dense network round the living cells of the body. The flow of blood in this network of capillaries can be beautifully seen by observing the web of the foot of a living frog under an ordinary microscope. The diameter of a capillary vessel is about that of a red blood-corpuscle; its frail wall is composed of thin and very flat cells, one deep. The flow of blood in the capillaries is slow, the rate being usually given as an inch per minute (though it must be remembered that in no region of the body could the blood pass through more than a small fraction of an inch of capillaries), but its most remarkable character is that the flow is constant and not intermittent and jerky as it is in the arteries. This change is brought about by the elastic character of the arteries, just as the elastic bag in a cosmetic spray-producer changes the intermittent pumping of the air by the hand into a continuous outflow. The blood as it passes through the capillaries alters in character; amongst other changes it loses some oxygen and gains some carbon dioxide, so that it becomes purplish (or venous) in colour.

The blood now leaves the capillaries passing into a number of thin-walled venules, each a little larger than a capillary; these venules unite into small veins and these into larger veins in a branching system resembling the arteries, only that here the current passes from branch to stem and narrows as it travels heartwards. The venous blood from the abdominal alimentary canal, the pancreas and the spleen, passes into the portal vein, as has been stated, and this vein breaks up into branches and these finally into capillaries in the liver so that the blood passing out of the aorta into the abdominal digestive organs has to pass through two systems of capillaries. But from other parts of the body, including the liver itself, the blood passes from twig to branch along the veins until finally it enters into one of two great veins or *venæ cavæ* which open into the right auricle. The veins are thin-walled compared with the arteries, and also very much more distensible. An increase in pressure which would make no apparent increase in an artery might increase tenfold the calibre of a vein. The causes that operate in the flow of blood in the veins are somewhat complex. First there is some back pressure due originally to the heart. Secondly in every movement of the body the muscles during their contraction press on the veins and urge their contents heartwards. This is one of the reasons why exercise is so beneficial and why animals, if they are kept on their feet too long and bereft of natural exercise, show swelling of the veins of the leg or even dropsy. Thirdly there is the suction which is exerted by the chest in breathing. When the thorax expands not only is air drawn into the lung but also blood is drawn towards the thorax along the great veins leading into it. At the same time the midriff or diaphragm compresses the contents of the abdomen and drives heartwards the blood contained therein.

The blood when it reaches the right auricle is subjected to the same cycle as when in the left heart. In the right ventricle however the muscular walls are much thinner and less powerful than in the left, and the artery arising from it, called the PULMONARY ARTERY, has within it a much smaller pressure than in the aorta. The right ventricle contracts at the same time as the left; the tricuspid valve is closed tight and pulled down; a quantity of blood equal to that expelled from the left ventricle

is forced into the pulmonary artery; the ventricle stops; the semilunar valves close; and the blood in the pulmonary artery must perforce pass onwards into a series of branches of which the first two into which the artery divides are destined one for each lung. In the same manner as already described a network of capillaries is formed which in this case lines the air cells of the lung. Here a marked change is produced. The blood which has entered the right auricle and ventricle and from this has gone into the pulmonary artery, is venous; here in the lung capillaries it gives off some carbon dioxide and gains oxygen so that it changes its colour from purple to bright red. The capillaries pass into venules and then into veins. The flow of blood through the lung is

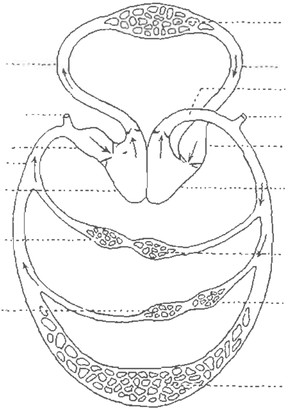


Fig. 52. Diagram of Circulation. (After Halliburton.)

sluggish, the pressure in the pulmonary artery is small, and as the whole system is inside the thorax the suction of the latter cannot count; but as the lung is continually shrinking and expanding the blood is worked along, aided by back pressure, until it enters the great pulmonary veins and then flows quietly into the left auricle. Thus the double circuit is completed.

The circulation from left ventricle to right auricle is called the GREATER or SYSTEMIC circulation; that from right ventricle to left auricle is called the LESSER or PULMONARY CIRCULATION. The shortest time the blood can take to pass through both circuits is 31 seconds in the horse; this, it must be remembered, is the shortest, not the average time.

A knowledge of this mechanism will explain the following peculiarities of the circulation in, say, a limb—

1. If a ligature be tied very tightly round the base of a limb, both arteries and veins will be compressed, the blood in the limb will be stagnant; none will enter and none will leave. If the ligature be tied less tightly so as to compress the veins and not

the arteries, blood will enter the limb, but none will leave, and, in consequence, the limb will swell up and become dropsical.

2. If a vein is cut, blood of a dark colour will well up from the wound in a continuous stream; the bleeding can be stopped by the application of pressure on the side AWAY from the heart. If an artery is cut, the blood will spurt out in bright-red jets that keep time with the heart beats. In this case the bleeding can be stopped by application of pressure on the side *near* the heart.

We have now to investigate the significance of the pressure in the systemic arteries and the changes which it undergoes. That such pressure should exist is due to the fact that the heart is continually pumping blood into the aorta and the elastic arteries, whilst the arterioles, by their constriction, hinder the escape of the blood into the capillaries. It is evident that the arterial pressure will rise—

(*a*) If the force and frequency of the heart beat is increased, the arterioles remaining the same;
(*b*) If the arterioles constrict still further, the heart beat remaining the same;
(*c*) If the force and frequency of the heart is increased, the arterioles at the same time constricting.

The muscles of the arterioles are connected with the central nervous system by two sets of nerves. In the first place fibres from the sympathetic system called *vaso-constrictor* can produce constriction of the arterioles; in the second place there are nerves of uncertain origin which produce temporary paralysis (inhibition) of the muscles and therefore dilatation of the arterioles. These nerves are termed *vaso-dilator*. Whenever an organ is called upon to act, more blood is required, and this increased flow can be obtained by the simple device of dilating the arterioles in the organ—the blood will flow in greater volume towards the region of lessened resistance. A still greater flow can be obtained if the arterioles in the organ are dilated, and the arterioles in other regions of the body are constricted; whilst an even greater flow can be obtained by these changes in the arterioles combined with an increase in the force and frequency of the heart beat. The proper amount of blood can therefore be regulated to a nicety. If the region requiring the increased blood-flow were a large one, say the muscles of the limbs, then if the arterioles of the muscles were simply dilated the resistance to the blood escaping into the capillaries would be so greatly reduced that the arterial blood-pressure would fall so much in amount that the blood-flow through other regions, and particularly the brain, would almost stop. This is obviated by other arterioles, and especially those in the abdominal region constricting so that the lessened resistance in the muscles is balanced by a greater resistance in the abdominal vessels. This explains why, for instance, digestion of a liberal meal proceeds so badly during violent exercise; the blood is flowing chiefly through the muscles, and a much diminished supply through the digestive organs in the abdominal cavity.

Investigation has proved to what an extraordinary extent the blood pressure is influenced by changes in the arteriolar calibre of the abdominal region; in fact the major changes seemed to be conditioned by its state so that the abdominal system has been aptly called the "resistance box" of the circulation. If the constriction of the abdominal arterioles were

altogether abolished the blood pressure would fall to such a degree that death would result, even though the arterioles in the muscles and skin were constricted to their utmost. This explains the pallid skin pinched features and general collapse when inflammatory trouble occurs in the bowel.

The actual pressure in the systemic arteries varies with each animal and to a slight extent with each artery. If a vertical tube were connected with one of the larger arteries of a horse the blood would rise in the tube to the height of about 9 feet and, until clotting occurred, would show oscillations at the same rate as the heart beat. It is the pressure in the arteries which produces the quick jetting of blood which occurs when an artery is cut and which is apt to give a false idea of the rate of flow in the intact artery.

General constriction of the systemic arterioles can be brought about by the following means:—

1. Salts of barium which act directly on the muscles of the arterioles.
2. The drug, or hormone, adrenalin, which acts on the receptive substances of the arteriolar muscles.
3. The drug nicotine (in its first stage of action) which stimulates the nerve cells in the sympathetic ganglia.
4. Venous blood, as occurs in asphyxia, which acts on the nerve cells in the medulla oblongata in the central nervous system, where vaso-constrictor impulses arise.

When general vaso-constriction occurs the resistance to the blood escaping into the capillaries is greatly increased and, if the heart were to beat at the ordinary rate, the arterial pressure would mount up to a dangerous extent. In such circumstances however the vagus centre in the medulla is stimulated and the heart is greatly slowed so that a dangerously high pressure is avoided. Conversely, when the arterioles, are dilated, either generally or only in the abdominal region, as occurs when certain poisons enter the circulation, or if the blood pressure is lowered by extreme hæmorrhage, the heart through the sympathetic system is stimulated to greater activity whilst at the same time the vagus ceases to act.

The arterial pressure in the lesser or pulmonary circuit is low and, as it varies but slightly, and as these variations are dependent on what is happening in the systemic circulation, they possess but little importance.

Pressure in the veins is always low, in fact in the great veins near the heart a negative pressure may exist in which case if the vein wall be cut, air may actually be sucked into the vessel.

When the left ventricle forces its contents into the aorta a pressure wave is started which rapidly spreads through the branching arteries and dies down before it reaches the capillaries. Much the same sort of wave is seen in a long rubber tube in which water is flowing under a little pressure (as in a garden hose). When a blow is struck on the tube near the tap, a wave can be seen running along and the jet from the nozzle can be seen to jump a very short time after the blow is given. This pressure wave in the arteries is called the PULSE and can be felt well whenever an artery is near the skin and has a bony background. The pulse, as felt by the finger, gives one the rate of the heart and the presence or absence of regularity in the heart beat. The initiated can also draw conclusions from the feel of the pulse whether "full" or "thready," &c., though it must be remembered that the veins which accompany the artery have a share in giving rise to what is termed the "volume" of the

pulse. The pulse wave is not single in character. Instruments for recording the pulse and frequently the finger alone can detect a second beat just after the crest has passed. This is the DICROTIC WAVE and is produced by the rebound from the semilunar valve when this closes and the ventricle passes into diastole.

The Lymphatic System.

The blood, as it passes through the capillaries, does not come into *actual contact with the cells of the various tissues.* The capillary, it has been said, has an actual wall. This wall however is so thin that it allows some plasma to leak through forming LYMPH which bathes the cells.

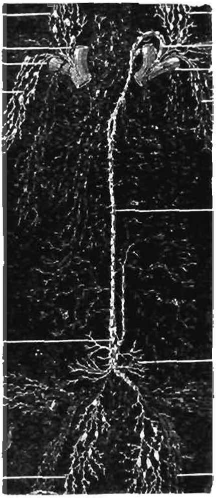


Fig. 53. Diagram of the principal group of lymphatic vessels. (After Quain.)

The lymph is contained in the loose connective tissue around the cells and all the interchange of nutriment, oxygen, waste products, &c., which takes place between the cells and the blood must be carried out through this medium. When the pressure in the capillaries rises, as occurs in local obstruction of the veins or in local dilation of the arterioles, *e.g.*, *inflammation, the amount of lymph increases, and may collect to such an* extent that the tissue becomes œdematous or dropsical. There is a very slow circulation of this fluid for it can be shown to pass from the tissue spaces into tiny thin walled vessels which run in clusters, join together, *and finally form an easily* detected tube running towards the heart and *close to the spine.* This is the THORACIC DUCT and it empties its contents into a large vein near the heart. In their course the lymphatic vessels

enter masses of adenoid tissue called LYMPHATIC GLANDS which are often situated near joints. These glands come into prominence when the lymphatics happen to drain an area where inflammation is going on; they swell up and become painful. Thus an inflamed wound in the human foot will produce swelling of the glands behind the knee and also of those in the groin.

The lacteal vessel in the centre of each villus belongs to the lymphatic system and, as mentioned, its contents pass eventually into the circulation through the thoracic duct.

When a drug or poison is injected subcutaneously it really is forced into lymph spaces, unless by accident it is introduced into a vein, in which case its distribution through the body is rapid. Now, absorption from the lymph spaces can occur in two ways. Firstly, the drug or poison may diffuse into the adjacent capillaries and so reach the general circulation. This occurs more readily the simpler the chemical constitution of the substance. But with substances of extreme chemical complexity, such as proteins, this diffusion is so small as to be practically absent and the only path of absorption open to the substance is to pass in the very tardy lymph-stream, through the various glands, into the thoracic duct and so into the general circulation.

The chief factor concerned in the flow of lymph is muscular movement which exerts an intermittent pressure on the vessels, and, as these possess numerous valves all pointing heartwards, the lymph is forced along in that direction. This gives us another beneficial action of exercise.

The peritoneal, pleural and pericardial cavities, and the synovial cavities in joints, may be regarded as potential lymph-spaces in which a minimum of lymph is found in health. When the portal vein is partially obstructed, the amount of lymph which can collect in the abdominal cavity may be estimated by the gallon; whilst collections of fluid in the pleural, pericardial, and synovial cavities are generally the result of inflammatory conditions.

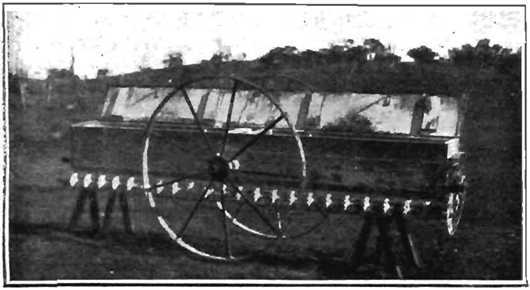
AN EFFECTIVE LIME SPREADER.

F. E. Lee, Agricultural Superintendent.

The spread of knowledge in connexion with the modern treatment of soils has brought into prominence the value of lime as a soil amendment. The use, however, of this invaluable material has been very much restricted owing to the unpleasant conditions incidental to the spreading. The illustrations below are taken from a lime spreading machine recently imported by Mr. R. G. Wilson, of Lyndoch Park, Whittlesea. The machine is simple in construction and is light enough in draught for a single horse. The width between wheels is 13 feet, the axle being geared on to a shaft carrying 22 cog wheels, operating small square linked iron pulley chains, 6 inches apart, which pass through the box containing the powdered lime. As the machine moves forward, the lime is drawn out by the links and is uniformly distributed on the land.

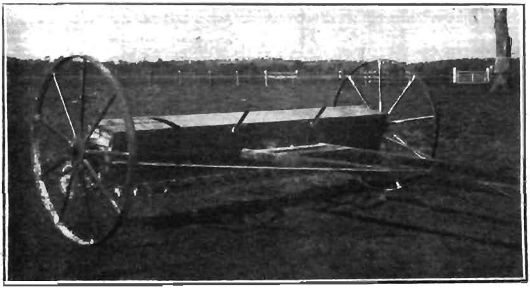
The machine may be adjusted to sow from 2 cwt. to 2 tons per acre, a higher speed-wheel being used for amounts over a ton per acre. The wide spread permits of 15 to 20 acres per day being sown—with no inconvenience to the driver. It is as well not to attempt to sow powdered lime on any but

a calm day. It might be further mentioned that the machine will not sow stones, and, consequently, if lime is improperly burned or insufficiently slaked, the larger pieces will remain in the box. Ground lime (crushed burnt limestone) or slaked lime, as well as sand and other kindred substances, are readily handled by the machine.



FRONT VIEW, SHOWING REMOVABLE SHAFTS AND GEARING.

For travelling, where gates are not wide enough to allow a clear passage, the wheels are removed from the ends and fitted in slots in the sides of the machine. The shafts may similarly be removed and fixed into one end of the lime box. A pair of small trestles allows the changing of the wheels to be made without difficulty by the driver.



MACHINE READY FOR ROAD TRANSIT.

The makers of the machine are Messrs. Jack and Sons, Maybole, England, and the price of the machine in question, freight and duty paid, landed in Melbourne, was £21. If these or similar machines were to be manufactured in the State it would give an impetus to the use of lime, the effects of which would soon make themselves felt, particularly in the southern parts of the State.

LIST SHOWING RESULTS OF ANALYSES OF SAMPLES OF ARTIFICIAL MANURES COLLECTED IN THE STATE OF VICTORIA UNDER THE PROVISIONS OF THE ARTIFICIAL MANURES ACTS.

Label No.	Official No.	Description of Manure.	Manufacturer or Importer.	Moisture.	Phosphoric Acid. Water Soluble. Found.	Water Soluble. Guaranteed.	Citrate Soluble. Found.	Citrate Soluble. Guaranteed.	Insoluble. Found.	Insoluble. Guaranteed.	Total. Found.	Total. Guaranteed.	Average Net Weight found.	Net Weight guaranteed.	Estimated Value per Ton.
				%	%	%	%	%	%	%	%	%	lbs.	lbs.	£ s. d.
317	21706	Superphosphate, Florida ..	Messrs. Cumming, Smith, and Co., Melbourne ..	10.90	16.69	17.00	0.99	1.00	4.96	2.00	22.64	20.00	225	224	4 8 2
307	21720	" " ..	" " ..	12.35	17.76	17.00	0.44	1.00	3.50	2.00	21.70	20.00	228	224	4 9 7
302	21725	" " ..	" " ..	9.30	16.95	17.00	0.94	1.00	5.09	2.00	22.98	20.00	229	224	4 9 4
336	21647	" " ..	" " ..	8.40	17.47	17.00	1.25	1.00	5.85	2.00	24.57	20.00	*	224	4 13 10
325	21714	" " ..	" " ..	10.52	16.70	17.00	1.15	1.00	5.39	2.00	23.24	20.00	225	224	4 9 4
326	21729	" " ..	" " ..	11.23	18.50	17.00	1.10	1.00	1.85	2.00	21.45	20.00	229	224	4 14 1
340	21657	Superphosphate, No. 2 ..	" " ..	10.27	17.37	14.00	1.03	1.00	2.95	2.00	21.35	17.00	*	224	4 9 6
316	21705	Superphosphate, Soluble ..	A. H. Hasell, Melbourne ..	11.44	16.63	18.00	2.21	1.00	..	1.00	18.84	20.00	226	224	4 7 10
320	21709	" " ..	" " ..	11.73	16.03	18.00	2.44	1.00	0.06	1.00	18.53	20.00	225	224	4 6 0
333	21645	" " ..	" " ..	10.70	16.90	18.00	3.07	1.00	..	1.00	19.97	20.00	223	224	4 12 6
327	21730	" " ..	" " ..	8.68	17.20	18.00	1.40	1.00	1.31	1.00	19.91	20.00	227	224	4 8 7
328	21731	Superphosphate, Federal ..	Aust. Explosives and Chemical Coy., Melbourne	8.98	17.66	17.00	1.90	1.00	1.45	2.00	21.01	20.00	226	224	4 13 0
344	21664	" " ..	" " ..	9.22	18.20	17.00	2.34	1.00	0.40	2.00	20.94	20.00	227	224	4 16 2
342	21649	" " ..	" " ..	6.14	18.36	17.00	1.52	1.00	1.59	2.00	21.47	20.00	*	224	4 14 10
323	21712	" " ..	" " ..	6.70	18.27	17.00	1.98	1.00	0.59	2.00	20.84	20.00	223	224	4 15 3
332	21644	" " ..	" " ..	7.95	15.36	17.00	3.75	1.00	1.55	2.00	20.66	20.00	223	224	4 9 6
305	21728	" " ..	" " ..	7.61	17.82	17.00	1.68	1.00	2.28	2.00	21.78	20.00	*	224	4 13 8
311	21723	" " ..	" " ..	8.55	17.80	17.00	2.04	1.00	1.76	2.00	21.60	20.00	225	224	4 14 4
312	21715	Superphosphate, No. 1 ..	Mt. Lyell M. and R. Coy., Melbourne ..	7.97	16.05	17.00	2.38	1.00	2.45	2.00	20.88	20.00	223	224	4 8 2
318	21707	" " ..	" " ..	9.46	16.98	17.00	1.77	1.00	2.65	2.00	21.40	20.00	226	224	4 10 5
303	21726	" " ..	" " ..	5.66	17.09	17.00	2.45	1.00	2.50	2.00	22.04	20.00	*	224	4 13 5
322	21711	" " ..	" " ..	6.10	16.71	17.00	2.10	1.00	2.95	2.00	21.76	20.00	225	224	4 10 8
331	21652	" " ..	" " ..	8.92	17.29	17.00	1.46	1.00	3.06	2.00	21.81	20.00	225	224	4 10 11
341	21650	" " ..	" " ..	8.29	15.64	17.00	3.77	1.00	1.86	2.00	21.27	20.00	*	224	4 11 2
351	21673	" " ..	" " ..	8.45	16.81	17.00	1.79	1.00	2.54	2.00	21.14	20.00	*	224	4 9 6
352	21659	" " ..	Wischer and Co., Melbourne ..	5.37	16.53	17.00	2.16	1.00	2.66	2.00	21.35	20.00	222	224	4 9 10
301	21724	" " ..	" " ..	6.14	15.55	17.00	2.92	1.00	1.50	2.00	19.97	20.00	*	224	4 7 0
308	21721	" " ..	" " ..	7.21	13.80	17.00	2.30	1.00	4.30	2.00	20.40	20.00	222	224	3 19 0
329	21732	Superphosphate, No. 2 ..	" " ..	6.31	12.65	14.00	2.91	1.00	2.64	2.00	18.20	17.00	*	112	3 14 5
321	21710	" " ..	" " ..	6.74	10.79	14.00	2.93	1.00	3.61	2.00	17.33	17.00	221	224	3 6 7
363	21677	Superphosphate ..	" " ..	8.42	17.04	17.00	2.14	1.00	1.72	2.00	20.90	20.00	220	224	4 11 3

338	21654	Superphosphate, No. 1 Standard Flag Brand	Renard Fertilizer Coy., Melbourne ..	7.33	18.03	17.00	1.47	1.00	1.69	2.00	21.19	20.00	218	224	4 13 3
355	21674	" " "	" " " "	9.09	17.03	17.00	1.92	1.00	1.60	2.00	20.55	20.00	*	224	4 10 1
304	21727	" " "	" " " "	8.22	18.05	17.00	1.31	1.00	1.38	2.00	20.74	20.00	*	224	4 12 4
362	21676	Superphosphate, No. 1 ..	Colonial Manures Coy., Melbourne ..	10.76	16.34	17.00	2.33	1.00	1.65	2.00	20.32	20.00	222	224	4 8 7
339	21655	" " ..	" " " "	9.76	17.28	17.00	2.08	1.00	2.32	2.00	21.68	20.00	222	224	4 12 9
337	21648	" " ..	" " " "	9.78	17.40	17.00	2.66	1.00	0.57	2.00	20.63	20.00	220	224	4 18 11

* Not weighed.

Label No.	Official No.	Description of Manure.	Manufacturer or Importer.	Moisture.	Nitrogen. Found.	Nitrogen. Guaranteed.	Phosphoric Acid. Water Soluble. Found.	Water Soluble. Guaranteed.	Citrate Soluble. Found.	Citrate Soluble. Guaranteed.	Insoluble. Found.	Insoluble. Guaranteed.	Total. Found.	Total. Guaranteed.	Average Net Weight Found.	Net Weight Guaranteed.	Estimated Value per ton.
				%	%	%	%	%	%	%	%	%	%	%	lbs.	lbs.	£ s. d.
354	21660	Dissolved Bones ..	Cuming, Smith, and Co., Melb. ..	11.04	0.79	1.00	13.19	10.01	3.07	3.88	3.84	5.48	20.10	19.37	*	224	4 17 9
315	21718	Nitro Superphosphate ..	Mt. Lyell M. and R. Coy., Melb...	8.96	1.83	1.60	12.49	13.00	3.18	1.00	3.09	2.00	18.76	16.00	228	224	4 14 10
313	21716	" " ..	Wischer and Co., Melb. ..	6.64	0.79	1.12	10.50	11.05	1.93	0.65	7.15	7.33	19.58	19.03	222	224	3 13 4
310	21651	Nitro Superphosphate, Federal	Aust. Explosives and Chemical Coy., Melb.	4.45	1.03	1.10	14.34	17.00	2.65	1.00	3.54	2.00	20.53	20.00	225	224	4 13 3
306	21719	Bone and Superphosphate	Wischer and Co., Melb. ..	6.37	1.90	1.50	8.95	8.50	4.28	0.50	6.04	10.00	19.27	19.00	224	224	5 1 3
343	21663	Bone and Superphosphate, Federal	Aust. Explosives and Chemical Coy., Melb.	4.15	0.86	0.75	11.85	12.75	4.58	0.75	5.20	6.00	21.63	19.50	222	224	5 2 0

* Not weighed.

List showing Results of Analyses of Samples of Artificial Manures, etc.—*continued.*

Label No.	Official No.	Description of Manure.	Manufacturer or Importer.	Moisture.	Nitrogen. Found.	Nitrogen. Guaranteed.	Phosphoric Acid. Found.	Phosphoric Acid. Guaranteed.	Mechanical Condition. Fine. Found.	Mechanical Condition. Fine. Guaranteed.	Mechanical Condition. Coarse. Found.	Mechanical Condition. Coarse. Guaranteed.	Net Weight Found.	Net Weight Guaranteed.	Estimated Value per ton.
				%	%	%	%	%	%	%	%	%	lbs.	lbs.	£ s. d.
373	21686	Bonedust	Cuming, Smith, and Co., Melb. ..	5.60	3.01	3.00	17.41	18.00	39.00	3.00	61.00	65.00	*	224	4 15 10
364	21690	,, ...	Wischer and Co., Melb.	9.88	4.48	3.00	20.02	18.00	24.00	3.00	76.00	70.00	*	224	5 17 8
353	21669	,, ...	Mt. Lyell M. and R. Coy., Melb.	6.59	3.65	3.50	18.50	19.00	38.00	3.00	62.00	38.00	*	224	5 6 6
335	21646	,, ...	,, ,, ,,	5.84	3.12	3.00	18.94	18.00	43.00	3.00	57.00	38.00	225	224	5 3 4
330	21733	Bonedust, Special ..	Cuming, Smith, and Co., Melb. ..	5.42	4.91	5.00	18.70	18.00	42.00	5.00	58.00	60.00	*	224	6 1 3

Label No.	Official No.	Description of Manure.	Manufacturer or Importer.	Moisture.	Nitrogen. Found.	Nitrogen. Guaranteed.	Phosphoric Acid. Water Soluble. Found.	Phosphoric Acid. Water Soluble. Guaranteed.	Phosphoric Acid. Citrate Soluble. Found.	Phosphoric Acid. Citrate Soluble. Guaranteed.	Phosphoric Acid. Insoluble. Found.	Phosphoric Acid. Insoluble. Guaranteed.	Phosphoric Acid. Total. Found.	Phosphoric Acid. Total. Guaranteed.	Potash. Found.	Potash. Guaranteed.	Average Net Weight found.	Net Weight Guaranteed.	Estimated Value per Ton.
				%	%	%	%	%	%	%	%	%	%	%	%	%	lbs.	lbs.	£ s. d.
334	21656	Potato Manure ..	Cuming, Smith, and Co., Melb.	7.24	1.00	1.20	13.82	14.82	1.48	0.86	7.70	1.72	23.00	17.26	4.00	4.15	225	224	6 11 3
314	21717	Root Crop Manure ..	Mt. Lyell M. and R. Coy., Melb.	9.62	3.52	3.25	5.38	7.25	3.75	1.00	1.67	2.00	10.80	10.25	4.69	4.25	227	224	5 9 11

* Not weighed.

W. PERCY WILKINSON, Acting Chemist for Agriculture.

Government Laboratory, Melbourne, 15th July, 1908.

GARDEN NOTES.

J. Cronin, Principal, School of Horticulture, Burnley.

The Tulip.

Tulips are hardy bulbous perennial plants, the species of which are found native in various parts of Europe, Asia, and Northern Africa. The species are numerous and variable. Having been in cultivation for centuries, and considered valuable plants for gardens, they have been hybridised to a great degree by florists with the result that an almost endless number of varieties including types of different form, colouring, and period of blooming have been raised. The tulip is undoubtedly one of the most beautiful of bulbous plants, and although producing its flower in spring, the season of plenty in the flower world here, is worthy of cultivation where the soil and climatic conditions are favorable. They were very popular in Victoria some years back, and were cultivated largely by gardeners, amateur and professional; but for a time, their popularity and cultivation decreased until it became unprofitable for nurserymen to stock them. The result was that a number of the finest varieties were lost, and sufficient inducement was not forthcoming to cause the importation of either the older standard kinds or the newer florists' varieties. Of late a number of gardeners have again taken up their culture and some beds of fine varieties are grown in the gardens at Toorak and other suburbs of Melbourne where gardening is a special feature in most of the large places.

SINGLE TULIPS.

DOUBLE TULIPS.

The types of tulips most largely grown in England at the present time are the Gesneriana, the so-called May tulips, and the late flowering or Darwin types, of each of which there are numerous varieties. Various species are also cultivated to a large extent, as are the early flowering types, though not so popular as formerly, and the double and parrot varieties.

SOIL—PROPAGATION—CULTURE.

The most suitable soil is a naturally rich sandy loam that is thoroughly drained. The plants thrive best in a cool situation that is protected from

rough winds and hot sun, but require a fair amount of light for the perfect development of the flowers. A site exposed to the morning sun, but sheltered from the north suits them admirably. Although tulips delight in a cool rich soil care must be taken in the selection of materials to produce such conditions where naturally deficient; the bulbs will not thrive if manure is placed in their proximity. Poor soils are best enriched by the addition of leaf mould or some fibrous surface soil that has been well mixed with some thoroughly rotted cow manure. Heavy retentive soils may be brought into fair condition by the addition of sand, ashes, or leaf mould.

Tulips are propagated from offsets of the bulbs and from seeds, the former being the method of perpetuating certain varieties and kinds. New varieties are raised from seeds. A plan that is found to be satisfactory is to plant the large flowering bulbs about six inches apart in the rows or patches, and set the offsets between them, thus insuring an increase without specially providing a place to grow the young non-flowering bulbs. Seeds should be saved as soon as they are ripe and stored until spring, when they should be sown in boxes or small beds of light soil. The young plants must be grown without disturbance for the first growing season. When the tops die down they require to be lifted and planted where they are to remain until they attain a flowering size.

Planting generally should be done early in autumn. To obtain border effects tulips are set in patches containing several bulbs, placed at a depth of three or four inches from the surface, and from six to eight inches apart. When planted in rows in beds the rows should be from twelve to fifteen inches apart. The bulbs may remain undisturbed for two or more seasons. When necessary to do so, they should be lifted as soon as the foliage turns brown. The bulbs are stored in a cool dry place until thoroughly ripened; when they should be cleaned and stored under cool conditions until the planting season arrives. Care must be taken to prevent the bulbs being heated during the resting season or they may perish.

A fair selection of varieties may be obtained from local seedsmen and nurserymen during summer, the self coloured varieties of the Gesneriana type being the best.

Flower Garden.

Cultivation of the surface soil; planting out herbaceous plants, bulbs, and annuals; sowing seeds; and attacking insects and diseases as soon as they appear, are important tasks at this season. An early and thorough working of the soil is often more beneficial to garden plants than a heavy manuring accompanied by slight cultivation. Soil for the reception of seed must be in a state of fine division to insure best results.

Chrysanthemums will demand attention about the end of the month from cultivators who aim at the production of large blooms. The beds should be again dug and manure, thoroughly incorporated, added if necessary. A moderately rich soil is preferable to one containing an excessive amount of stable manure. Plants of moderate, firm, and sturdy growth, which will under fair treatment produce fine flowers of good form and quality will result from the former, while from the latter, the plants are likely to be large and difficult to manage, and the flowers produced, generally coarse, overgrown, and devoid of grace and colour.

A few of the varieties distributed as novelties by the nursery trade last season are worthy of being added to good collections, and include "Hamilton," "Mrs. Phillips," "Beauty of St. Kilda," "Mrs. J. C. Neill" and "Amy Laidman"

Novelties of promise offered for sale this season are:—"Rose Pockett," "W. M. Moir," "Mrs. C. H. Totty," "Lady Dudley" and "Mrs. Emily Austin."

Roses should on the appearance of aphis or mildew be promptly sprayed with a strong tobacco wash in the case of the first named, or dusted with flowers of sulphur while the foliage is wet with dew in early morning for the latter. Growth buds that are developing out of place should be rubbed out on appearance. A fairly open and well spaced set of new shoots should be aimed at.

Kitchen Garden.

September is a busy month in gardens where a succession of fine vegetables is desired. The soil must be persistently worked to preserve moisture, destroy or prevent weeds, and assist the young crops by aeration. Seeds of various vegetables must be sown, growing crops thinned, and transplanting performed as occasion demands.

The old method of cultivating tomatoes by sowing the seeds where the plants are to remain and gathering what produce may result without attention to training and feeding the plants is rapidly disappearing. It is found that to grow good crops of this excellent fruit a system of early raising of plants, combined with staking and training, and the use of fertilizers to feed the fruit is necessary. Under this system crops of fine appearance and quality are produced early in summer when the fruit is specially valuable. The seeds are sown early in August in pans or boxes of light soil, and placed in heated frames to germinate, and grow the young plants for a time. Seeds are sown thickly. When the young plants are fit to handle they are transplanted into flat shallow boxes containing light soil, and grown on for a time under the warm conditions, being gradually hardened to fit them for planting out about the beginning of October. The various transplanting tends to produce stocky and sturdy plants with a disposition to early bearing. Many market gardeners near Melbourne have abandoned the raising of plants in hot bed frames, finding it to be more profitable to purchase the plants from nurserymen who raise them in immense numbers in hot houses and are able to sell them at reasonable rates. About 3,600 plants are required to plant an acre when set out four feet between the rows and three feet between the plants in the row, a distance that allows room for development and cultivation. Each plant is set out at the base of a stake that has been driven firmly into the ground, and is trained to a single stem by some growers—to two or three stems by others—and the shoots tied to the stakes as they develop. All lateral growths are pinched off as soon as they appear, the flowers alone being allowed to remain. When the fruit is setting freely a mulch of stable manure is applied or a rapid acting fertilizer is worked lightly into the soil. Blood manure, dessicated night-soil, and sulphate of ammonia are used by market gardeners, the preference being determined by the character of the soil. After the fertilizer is applied irrigation follows if the conditions are hot and dry, the surface being cultivated as it dries to conserve the moisture. Experience shows that a moderately rich soil is required to grow the plants strongly enough to bear heavy crops but that an excessive amount of manure in the soil when the plants are set out produces large leaf growth, and checks early bearing. Popular varieties in the metropolitan district are:—Early Large Red, Earliana, Keys Prolific, Chalks Early Jewel and Early Jersey.

Celery also needs special treatment to insure a supply over a long season. It requires a deep cool and rich soil, and abundance of water

during the growing season. To secure an early supply, seeds should be sown in August under the same conditions as advised for tomatoes. In October seeds may be sown in beds in the open ground for transplanting later. From two sowings at the periods mentioned several transplantings may be made. The early plants should be transplanted into boxes or shallow beds of light, fairly rich, soil as soon as they are about an inch in height allowing a space of four to six inches square to each plant. They will require to be shaded after transplanting until established, and liberally watered during dry weather. When six inches in height, stout and stocky, the plants must be carefully lifted with a ball, or rather square, of soil attached, and planted in the trenches or beds prepared for their reception. The common practice, and undoubtedly the best for early planting, is to set celery in trenches where a supply of water is available to give the swamp-like conditions under which the plant is found growing naturally. Trenches are dug to a depth of about a foot, and a liberal dressing of manure is placed at the bottom; some of the surface soil is replaced over the manure, and water sufficient to thoroughly settle the whole is applied. When fairly dried the trenches are fit for the reception of the plants. Trenches that will accommodate two rows of plants, allowing about one foot each way to each plant are found to be the most economical and easily managed. During the growing season abundance of water is necessary, and the plants must be kept free from weeds. Late crops may be grown without digging deep trenches, but in all other respects similar treatment is necessary.

Celery is blanched by excluding light from the stems of the plants. It should be done about a month before the plants are ready for use. Various means are adopted, the most common being to draw the earth up to the plants, burying the stems in the process. Tying brown paper around the stems, enveloping them in drain pipes, or fixing boards close to the plants in the rows, to exclude light, are other methods more or less in use. Whichever course is adopted the tops and growing centre must be preserved clean and in full sunlight. With a succession of plantings celery may be had in good condition for several months.

INSECT PESTS IN FOREIGN LANDS.

SEVENTH PROGRESS REPORT BY MR. W. W. FROGGATT, F.L.S., F.E.S.

R.M.S. China, Red Sea, 23rd May, 1908.

I have the honour to furnish you with a brief summary of my investigations since I posted my last at Constantinople.

I left that town on the evening of the 30th of April bound to Cyprus, *viâ* Smyrna and Beyrout, reaching the former town on the following day, when I went ashore and went through the markets where everything under the sun, from old weapons to fruit and vegetables, can be purchased. All the vegetables were of the same kind and quality as those in the Stamboul markets, to which Smyrna sends a large amount of produce.

At Beyrout the cultivation of the mulberry is the chief industry, and the whole valley of the Dog River, and for some miles beyond the town, is nothing but mulberry plantations, while there were scores of silk reeling machines and primitive hand looms for weaving in the houses I passed through. A large quantity of fruit and vegetables is grown in the

neighbourhood, and the whole valley is dotted with wells and pumps for irrigating the land. Large quantities of loquats, some of rather fine quality, were exposed for sale in the markets; green cherry plums were also sold in large baskets. The large oblong Jaffa oranges were plentiful, with several small and poor varieties. All the trees in the gardens of the town were covered with nets to protect them from the birds. Very small cucumbers and immature young squashes, with quantities of slender French beans, were the chief vegetables.

Early on the morning of the 8th May we anchored off Larnica, where I joined forces with Mr. Clement Reid of the British Geological Survey, who was visiting the island of Cyprus to report upon its water supply. I travelled in his carriage to Nicosia, a distance of 26 miles, over a most barren strip of white chalky mud and limestone hills and valleys. Whereever there was a bit of land it was planted with barley; but until we came within a mile of the capital there was absolutely no shade or trees, except a few Australian wattles planted round the Rest Houses and Police Stations. As soon as we arrived I presented my credentials to the Director of Agriculture (Mr. Saracomnos) and made an appointment to go out next morning and see the methods they adopted for catching the young locusts. The same afternoon we attended a reception at the High Commissioner's, and left our cards. Next day I had an interview with Sir Charles King-Harmari at Government House and obtained his authority to get Mr. Bevan, Assistant Director of Agriculture, to go round the agricultural centres of the island with me.

With Mr. Saracomnos I drove out to the low, scrubby hills where the locust-catchers were at work sweeping the ground with large calico nets shaped in front like a bow, so that the flat side was drawn over the surface of the ground, and the young hoppers fell into a small bag-like appendage at the bottom of the net, from which they were shaken into a small bag that the hunter carried tucked into his belt. We then went down to the Government Camp and saw the method of buying them by weight from the hunters, who receive a slip giving the amount due to them, which they present at the Treasury for payment. The accumulated catch is shaken into a large sack which is finally emptied into a pit of quicklime and covered up. Since the time of the British Occupation of Cyprus in 1879, active operations have been carried on against the locusts that breed in the rough barren lands of the island, and which, under Turkish rule, often devoured the greater part of the crops grown on the island.

At first, attention was turned to the collection, and destruction of the eggs, and a tax of 7 to 8 okes of eggs (1 oke = $2\frac{3}{4}$ lbs.) had to be paid to the Government by every able-bodied man on the island. This collection started on the 1st of June, and by the end of the year 138,422 okes of eggs had been brought in and buried. Each pod of eggs was found to contain from 30 to 35 eggs, and each oke contained from 450 to 500 pods, so that the quantity of eggs destroyed made a total of two thousand millions. In spite of this work being carried out, the locusts did not appear to decrease in the following year, and the natives lost heart. In 1881 it was decided to use Mr. Richard Muttei's methods of pits and screens, and this was the plan adopted until 1897, when an income tax was made law, and the revenue derived was used for the expense of killing out the locusts. Screens were erected and pits dug along the line of march of the locusts as soon as they emerged from the eggs and began to feed. They were driven against the screens, from which they fell, and moving downwards encountered the pits into which

they tumbled. Men with spades covered them over with earth, and trampled them down when full. In 1883 the Government employed 2,631 men on the work of locust destruction, and 7,543 screens were in use, most of which were in 50 yard lengths. In the following year 11,085 screens were in use, when the sum of money expended in this work reached to £14,746, and between the years 1881 and 1886 the sum of £66,841 was spent on this work.

In commenting on this expenditure, the Commissioner in his report says :—

"Large as this expenditure may seem, it is certain that it has already been recovered by the island many times over, in the value of the crops saved. Assuming that only ¼ of the wheat and cotton, and ⅛ of the barley and oats would have been destroyed, had no vigorous measures been taken to destroy the locusts, the loss to the island would have amounted to £80,000. These figures are derived from the estimated value of the crops based on the assessment of the tithes of the years 1882-83-84."

From this date the Government had the locust plague well in hand, and the operations were reduced and the expenditure fell to £3,598 in 1894, though it rose again to £7,000 in 1896. At the present time the only method adopted is the catching of the young hoppers with nets as previously described, and the amount expended has dwindled, so that the income tax has been relaxed. I am informed on very good authority, however, that it must be also taken into consideration that, since the British occupation, a very large area of land in which the locusts laid their eggs, has been broken up for cultivation, so that they have been driven into the barren lands where they can be much more easily dealt with than in the first years of the crusade against them.

On the 10th May, accompanied by Mr. Bevan, I left Nicosia and travelled in a coach and four horses across the island to the town of Limasol, the centre and port for the wine and carob bean industry. This was a distance of 55 miles; the road was over rolling low chalk and marl lands for the first ten miles, and then we were well into the carob and olive tree country. The carob tree grows on very poor soil beyond the area of irrigation, and is apparently as hardy and long-lived as the olive tree; the trees are all grafted, and the beans are picked about the end of June. The date upon which the picking is to commence is fixed by the High Commissioner, on account of the fact that the ownership of the trees is so complicated. Many of the trees belong to persons who do not own the ground on which they grow, and if they were allowed to gather the harvest at any time, there would be some trouble. In 1906 there were 44,965 tons of carob beans exported from Cyprus valued at £157,452; most of these are ground up and made into cattle foods, at least half of the crop going to England. There is a wild species of this tree growing upon the island, but the pods are of no value; by the natives it is distinguished from the cultivated form by a Greek name, meaning "Sent by God" otherwise, self-sown. I believe that at one time it was proposed to plant the carob tree in the dry parts of Australia, and as a tree capable of growing such immense crops of edible beans in our stock country, I think the experiment could be revived; young plants or seeds could be easily obtained in any quantity from the Forestry Department of Cyprus. The olive trees in some parts of Cyprus are very old, so old that in many places the central portion of the tree has rotted out, and each angle has grown round, forming a bunch of three or four trees. These are said to be in many instances four to five hundred years old; yet when we passed through them they were one mass of bloom, and as

vigorous looking as the younger trees. However, as most of the land suitable for olives will grow vines, they do not grow enough olives for local consumption, and some olive oil is imported.

We arrived at Limasol late in the evening, and called upon the District Commissioner who had arranged to send us mules to Plateris to take us over the mountains. On Monday morning we started up through the foot hills covered with vines—for the natives plant their vineyards up to the very top of the mountains, on slopes so steep that it is wonderful how they can gather them. All day long we met caravans of muleteers with their animals carrying a pigskin of wine on either side of the pack saddle. As they treat most of their wine with gypsum, and often paint the pigskins on which they carry it to market, with a coat of tar, some of the native made wine has a somewhat strong flavour, but there is an English Company which has taken up the wine-making industry and the export of an improved quality has resulted. In 1906 there was an export of 36,281 gallons of Commandaria, worth £1,993, and 878,059 gallons of other kinds of wines worth £20,487. The greater part of this wine goes to Egypt, though the Company makes shipments to England, and Germany. We stopped at the village of Perapidha, where next morning some of the Greek villagers brought me specimens of a small moth grub that was eating off the buds of the vines. Odium is very bad on these high lands, and the Government imports large quantities of sulphur and distributes it at a very low rate, or free, to the vine growers, but they are only just beginning to take the matter up. Later on I found a very curious leaf gall upon the vines which at first sight appeared exactly like leaf galls of phylloxera, but on closer examination appears to be caused by a leaf mite. Cyprus is one of the few vine growing places in the world where phylloxera has not been discovered, and since the British Occupation, no plants of any kind can be imported from countries where that disease is known to exist.

On the Tuesday night we camped in the Summer Government House on the top of Mt. Troodes (6,000 feet above sea level), occupied by the Commissioner and his staff later on in the season. Next morning by winding side tracks we rounded Mt. Olympus still covered with snow, and turned down the great Athalassa valley. The first village we stopped at, Prodromus, is the highest up the mountains on the island, and confines its attention to growing apples. Here, as everywhere else, we found the trees covered with the nets of a small "web worm," a Lepidopterous larva that does a great deal of damage. There is another one in the pine forests that often strips the young pine trees of their needles and covers them with masses of its nets. There was also a large borer in the branches of the apple trees, but the owner said they were only found on the hillsides. At mid-day we came into the village of Pedoulous, also perched on the mountain side. It has very rich black soil, devoted to cherry and mulberry trees, but as in the upper village, though they were all irrigated from the river coming down the valley, there was no attempt to prune or cut any dead wood, and many of the cherry trees were an immense size.

From here, downwards, we passed through many small villages built along the cliffs, our path sometimes winding over the flat earthen roofs of the lower houses. At dark we had reached the bottom of the valley, and at eight o'clock entered the Turkish town of Lefka where all the oranges on this side of the island are grown. Here we stopped at the Police Station, as there was no hotel or Rest House in the town. Next

morning, under the guidance of a "zaptich" (Turkish policeman) we went through a number of the orchards, which in most cases were regular thickets, as young trees had been planted, or seedlings had grown up, all through the place among the older trees. The oranges had been nearly all gathered, but still there were some on the trees, and a great number on the ground. Those upon the ground had been all cleaned of their contents by the rats, and were simply skins. I could find no signs of fruit flies, nor could I find out from the owners if they ever suffered from the pest; but red scale was very common, and did a good deal of damage all through the orchards, and is just as plentiful in all the gardens about Nicosia. From Lefka we rode to the railway terminus at Mulfore, and returned to Nicosia that afternoon after a very interesting trip across the island.

The Forestry Department in Cyprus is a very important institution, as there is a great deal of the island that is treeless, while the high mountains are covered with fine forests of pines. Mr. A. K. Bovill, who has charge of this work, has planted a great number of different species of Australian trees, chiefly Eucalyptus and Acacia, and at Athalassa has a large area of barren marl and chalk hills covered with thickets of young wattles which are growing well in very poor dry soil. He is extending this every year and hopes before long to supply the towns with firewood. At present, round all the towns, they have no firewood, importing charcoal and using a small prickly shrub (*Poterium spinosum*) that covers the low hills, to do all their cooking and baking.

In the island there are about a quarter of a million goats and as there are no fences they are shepherded through the forest and open lands, and supply food, milk, cheese, butter, skins for boots, hair for ropes, bags, &c. As soon as the foresters enclose areas for planting, the villagers cry out that they are being robbed of their free range. The Forestry Department says that the goat, from the amount of trees it destroys, is its greatest enemy, but the goat is a vested interest that has to be considered in all forest work. There is about the same number of sheep in the country, usually shepherded with the goats. They belong to the fat tailed variety, the tip of the tail being twisted like a corkscrew, and most of them are black or piebald. Their wool is almost hair, and the best is worth only about 6d. per lb. The Department of Agriculture is trying to improve the flocks, but finds it very slow work.

The following day I left Nicosia at 6.30 a.m. for Famagusta, and reached there at 10 a.m. I called upon the District Commissioner (Mr. Travers) who very kindly placed one of his staff and a coach at my disposal to inspect the orange orchards of this district about three miles outside the town. The soil of this orchard district is very fine sandy loam. It is all under irrigation, the water being drawn up from wells about 20 to 30 feet in depth by the old wheel and earthenware jars, worked by a mule. The trees are planted in deep basins about 9 feet between each tree, and the water is distributed from the main channels. For about five months they do not need to use water but later on once a week and, when the crop is on the trees, twice a week. They could not understand how we could grow oranges anywhere without regularly watering the trees, as they have little or no rain for six months when the crop is ripening. The trees are budded in a very primitive manner, but all the best oranges and pomegranates are grown in this district. They are quite as large and well flavored as any of the Jaffa oranges that come into the market at Constantinople, and besides the long oval form there is a large hemispherical one just as fine. The Commissioner told me that

the oranges from this place took the first prize in London at the Show. Though Mr. Saracomnos told me that fruit fly was a common pest in these orchards, the growers did not seem to think much about it. The "disease" as they call it, that did an immense amount of damage to their trees, and is still very bad, is our common red scale (*Aspidiotus auranti*). This scale is very common all over the Cyprus gardens, attacking roses, and I even found it on wattles. They are now painting the tree trunks with lime wash, and they do a little spraying after seeing the results of experiments by the Department of Agriculture; but, as one orchardist said, "The Good God sent it, He will take it away," and this is the attitude of both Greek and Turk in the East. In 1906, 8,431,217 oranges, valued at £6,056, were exported from Cyprus, chiefly to Egypt, while in the same year 42,374 cwts. of pomegranates, valued at £8,107, were exported.

A good many mulberries are grown in some districts and the Department has encouraged the growing of silkworms by seeing that all the seed (eggs) imported is pure; most of this is sold in the cocoon, but a certain amount is made into native silk with hand looms in Nicosia.

I left Cyprus for Port Said at midnight on the 15th and reached there early on the 17th, catching the train to Cairo at 8 a.m. and reaching the latter place at 2 p.m. The next morning I went to the offices of the Khedivial Agricultural Society, where I met Mr. F. C. Willcocks (Entomologist to the Society), Mr. Balls (Botanist), and Mr. Hughes (Chemist). This is a private Society, but is supplemented with a sum of money from the Government to pay the salaries of the officers, who have well fitted laboratories and an experimental garden, where experiments in breeding cotton are carried on in conjunction with other crops. I went through their collection, and also over their plots. We called upon Mr. Brown who is in charge of the Gardens of the School of Agriculture, a separate Institution, the Director of which (Dr. Fletcher) I met on the following day.

The worst enemy of the cotton all over Egypt is the bollworm (*Earias insulana*), which lays its eggs upon the square, and the young caterpillars burrow into the small boll, damaging it, so that it falls off and never reaches maturity, much after the same fashion that the larva of the American boll weevil does in the United States. The moth is a very handsome little green creature, and the species found feeding upon cotton growing at the Hawkesbury College, and also at Moree, and described in the *Agricultural Gazette of New South Wales* as *Earias fabia* (1903) is identical with this variable and widely distributed species.

The fruit industry is very poorly represented in Cairo; most of the best oranges are imported, and it is very curious that while there is some red scale upon the orange trees here, the common and by far the worst scale of the citrus trees in Egypt is the round scale (*Aspidiotus ficus*), the fruit often being thickly encrusted with the scale. There is quite a number of apricot gardens around Cairo, but the trees, apparently all seedlings, are let to run wild, and though they are irrigated, the fruit is very small and is gathered by shaking the trees and gathering it out of the dust. In the market there was a great quantity of fine vegetables of all kinds, and on several stalls I saw bundles of vine leaves for sale; the seller told me that the Arabs slice them up and eat them with rice.

I visited the Survey Department where I saw all the plans of the Nile Delta lands, with their thousands of little plots of freehold land often

they grow up and start to mature the scale will disappear, or almost so. Oaks with large leaves are more subject to the scale than those with smaller leaves. The goldfinches are the greatest enemies the scale has. It is wonderful to see how well they can clear an oak tree.

ERADICATION OF BRACKEN.

Alfred J. Ewart, D.Sc., Ph. D., F.L.S., Government Botanist.

The fronds should be burnt off if possible. If not cut off and used for bedding, or dried and burnt in heaps, they may be ploughed in if the land is at all poor in humus, but are then apt to be raked out again with the rhizomes.

The land should be ploughed as deeply as possible, and the rhizomes near the surface raked out in rows by a horse rake and then into heaps. If chaffed with hay, especially after steaming, and placed in a silo the rhizomes make good nutritious food as they contain much starch. The fodder should not contain more than 10 to 20 per cent. by weight of the rhizomes since they contain large amounts of tannin and other astringents and by themselves are unpalatable and injurious in their action on stock. The moment the land is clear and fairly well broken up, potatoes should be planted and repeated a second year, or the first crop should be followed by drilled maize or some other green crop which can be worked between the rows while young and which when older covers the ground with dense leafy foliage. In this way a small but immediate return can be obtained while the land is being cleared, but in any case drainage will be necessary if the land is at all wet or sodden. Bracken land usually needs liming, half to one ton per acre, or even more when first broken up, and within two or three years needs ordinary farmyard manure. Phosphates will only be needed later on when grain is grown. The above plan has succeeded very well on bracken land near Melbourne, an immediate profit being secured from newly broken bracken land.

THE PROCLAIMED PLANTS OF VICTORIA.

(*Continued from page* 480.)

Alfred J. Ewart, D. Sc., Ph. D., F.L.S., Government Botanist; and J. R. Tovey, Herbarium Assistant.

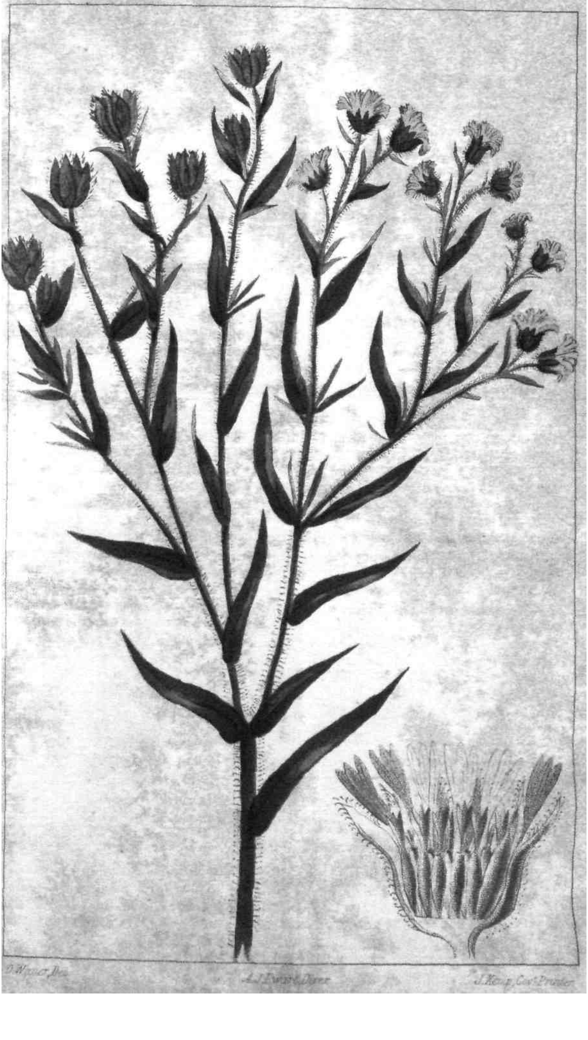
The Pitch Weed.

Madia sativa, Mol.

This erect annual, with opposite or alternate narrow pointed leaves, and small yellow heads of flowers is obnoxious on account of its sticky hairs, and though not of any appreciable economic value is only locally abundant or troublesome. It has been proclaimed for the shire of Violet Town.

The plant is a native of Chili, but probably reached Victoria *viâ* Europe, where it is sometimes grown for the nutty cooking oil extracted from its seeds. Since the seeds do not appear to be long lived, and the plant is an annual, it is easily kept under by cultivation and hoeing, if care is taken to keep waste places, and the edges and borders of fields clean. The plant may be largely pulled out of pastures by using a closely toothed horse rake or scuffler after rain before it has ripened its seed.

PLATE 28.



FIFTH PROGRESS REPORT ON VITICULTURE IN EUROPE.

(*Continued from page 479.*)

F. de Castella, Government Viticulturist.

Almeria and the Shipment of Fresh Grapes.

On the 12th December I arrived at Almeria (pronounced Al-merée-a) by steamer from Malaga. We passed without calling at the small seaport of Motril, chiefly remarkable as the principal centre of sugar cane culture in Spain, nestling under the brow of the Alonjarras mountains, a branch of the snowtopped Sierra Nevada range; the climate is if anything milder than that of Malaga.

When approached from the sea the town is one of the most picturesque I have seen, the old Moorish citadel standing out boldly against the background of rugged mountains so dry, rocky and barren as to be unfit for any form of cultivation. The only vegetation on them is a little Esparto or Alfa grass, an important article of commerce used in England and other countries in the manufacture of paper, which furnishes a means of livelihood to those who gather it.

Almeria is so widely known on account of its fresh grapes which, packed in granulated cork in barrels, are shipped to all parts of the world. This important industry is another striking example of the specialization which is so noticeable a feature of modern European viticulture. Scarcely any wine is made and no raisins are dried in this neighbourhood, but every available acre where there is sufficient soil, and where water can be brought to it, is planted with vines which bear the grapes which have made this port famous.

The Almeria table grape industry is worthy of serious consideration by Victorian vinegrowers. The chief cause which has contributed to its rapid expansion of late years is the remarkable keeping qualities of the Ohanez grape—the leading variety cultivated. When packed in cork dust it withstands the attack of moulds and shipped as ordinary cargo it is transported in good order on voyages of several weeks' duration. Objection is sometimes taken to it as being tasteless and leathery compared with many of the magnificent table varieties of recent introduction. This is true, but the proportions the industry has assumed and the way it has displaced others in Southern Spain are proof of its remunerative returns in localities suited to its growth.

The Ohanez has already been introduced into France; and the French authorities have recently studied the question with a view to encouraging the cultivation of the Ohanez. It ripens its fruit, however, too late for the French climate, otherwise it would no doubt be grown on a large scale in that country. As it is, its cultivation has not proved a success.

In Victoria its successful growth has far brighter prospects. In the northern portion of the State, quite as warm in summer and autumn as Almeria, there is no doubt as to its ripening as well as in Southern Spain; consequently it is worthy of a trial in our warmer districts.

As regards markets we would have several advantages. The six months difference between the seasons of the northern and southern hemispheres

causes our grapes to ripen at the time of year when there are no grapes obtainable north of the equator. The industry would not have to fear European competition. Our proximity to India, China, and Japan, as well as other countries in the Far East should give an accessible outlet for large quantities of fresh grapes. Even now Almeria grapes are shipped as far as Singapore and Java, where they arrive during the winter months; but from Australia they would be landed in early summer, a period when a brisk demand can be reasonably depended upon. The possibilities in the way of shipment from Victoria of fresh grapes to the Far East are enormous, and requires the serious attention of growers.

GENERAL VIEW UNDER THE "PARRALES" AT VINTAGE TIME.

The history of this industry is interesting. According to the monograph on the Ohanez grape by F. Richter in Messrs. Viala and Vermorel's Ampelography, this variety is an ancient Spanish one, probably a spontaneous seedling found among the wild vines at the time the Christians returned as conquerors to Almeria after the expulsion of the Moors in the reign of Ferdinand and Isabella in the 15th century. The opinion, often held by the local residents, that it originated near Ragol and la Daira, seems therefore to be incorrect. The remarkable keeping qualities of the grape led to its extensive propagation, and the industry has continually expanded.

In 1900 nearly 900,000 barrels (each containing 50 lbs. nett of fruit) were shipped from Almeria, chiefly to England, Germany, and America; by 1902 the shipments had increased to over 1,000,000 barrels; and at the time of my visit the 1907 shipments had reached the astonishing total of 2,443,333 barrels, and a few more had yet to be forwarded. Last year's crop would thus amount to some 2½ million barrels. The demand for land on which to plant vines has been so considerable that even that formerly used for market garden purposes is now converted into *parrales*; in consequence of this, vegetables are scarce and dear in Almeria. So important is this grape shipping industry that the forwarding of minerals —immense quantities of which leave the Sierras annually *viâ* the port of Almeria—is often suspended during vintage time.

The district is a most picturesque one, rendered so by the parrales, or overhead trellises of vines and the prickly pears or chombos, which abound everywhere. This plant is to be seen everywhere throughout Andalucia, but Almeria was the first place where I found it planted in regular lines and treated as a fruit tree. It is true that cultivation was much simplified, as the prickly pear will thrive in land too dry for weeds to grow.

PARRALES BEFORE PRUNING, SHOWING SYSTEM OF TRAINING AND ARRANGEMENT OF WIRE.

The chombo plays a large part in the bill of fare of the poorer classes. The fruit is very different though from what we are accustomed to here, being much larger and more succulent. One variety in particular is much esteemed. I was assured by a local resident that if it were known in Paris or London it would be considered a great delicacy. I noted, nevertheless, that the chombo seldom found a place among the fruit served at the hotel tables.

The vineyards are situated on the almost level land in the valleys which wind about among the steep rocky hills, following the course of the river, and of the smaller creeks which feed it in winter, though they are dry during the summer months. The railway line to Guadix and Granada runs for many miles through picturesque parrales or high overhead trellises which are unique in construction and arrangement and give a special character to these vineyards not easily forgotten.

Several other localities in Southern and South-Eastern Spain also ship fresh grapes. Alhaurin and Coin, near Malaga, have already been referred to. (See Fourth Report.) Further round the South-East Coast, near Alicante, this form of viticulture is an important industry; but Almeria is, without doubt, the most important centre, and the one where it can be studied to greatest advantage.

CLIMATE AND SOIL.

The climate is warm and very dry—so dry that without irrigation the grape shipping industry would not be possible. I was not able to ascertain the average annual rainfall, but it cannot be much over 12 inches. Last year only 10½ inches were registered, whilst a couple of years back it was only 8 inches. Long periods without any rain are of frequent occurrence.

The soil is a mellow loam, varying a good deal. The geological formation appears to be chiefly limestone of secondary age, though primary slates are also to be found in the neighbourhood. A curious formation is met with in some of the vineyards where alternate bands of good friable loam are separated by comparatively thin horizontal layers of hard water deposited limestone. In some cases, by making a hole through this crust where it occurred at a depth of about a foot the vine was permitted to send its roots down into the good soil underneath. In other cases this hard layer was entirely removed by blasting, at considerable expense. Analyses were not available, but judging from the fact that many growers are satisfied with Riparia stock the lime contents of the soil cannot be high. This relative freedom from excess of lime, though the geological formation is a limestone one, is not uncommon if it be hard limestone, and not the soft Tertiary form. The soil, though of good mechanical texture, is not a very rich one. The best shipping grapes are said to be produced on the poorer soil.

RECONSTITUTION.

The Province of Almeria was officially declared to be "Phylloxerated" in 1888, so reconstitution is quite 20 years old in the district. As is so frequently noticeable where vines are allowed to attain large size, the progress of the pest has been comparatively slow—not nearly so rapid as in Jerez or Malaga, where the vines are small and closely planted. Even at the present time some parrales of ungrafted Viniferas are occasionally to be met with. They are gradually being replaced by grafted vines; although still alive, many of them have suffered so much from the presence of Phylloxera on their roots that they no longer give profitable returns. At one vineyard I visited near the village of Huercal the substitution was being carried out by intermediate planting of American vines between the old ones. These were to be grafted later and gradually trained to take the places of the original vine. The considerable distance apart (20 x 20 feet) renders such a course possible. Even so, this method is not very satisfactory and, as might be expected, better results are obtained by rooting out entirely before replanting. The tendency nowadays is to plant the grafted vines somewhat closer than the old vines.

On the vineyard referred to some of these old vines were of truly remarkable size; some I measured had a girth of 19½ inches a foot above the ground. It is this very considerable development, no doubt aided by irrigation, that has permitted ungrafted Viniferas to survive so long.

Another curious fact which I have also noted in other vine-growing centres, both in France and Spain, was brought under my notice in Almeria. This is a seeming diminution in the virulence of Phylloxera; of recent years the vines first attacked died off rapidly, whereas those which have survived until now die more slowly. The cause is not very apparent, nor has the point much practical value. In spite of this partial resistance their death is only a question of time, and they must, sooner or later, be replaced by grafted Americans.

The chief stocks I saw being used were Riparia Gloire, Rupestris du Lot and A.R.G.I. That Riparia should have been used largely at first is not astonishing, for 20 years ago saw the height of the popularity of this species in France; that it is still used at the present time is more remarkable, and is explained by the fact that the soil is deep and friable and assisted by irrigation. To see Riparias supporting the enormous overhead trellises or parrales nevertheless surprised me, as it is in direct contradiction to the unsuitability of this stock for long pruning which was so strongly impressed on me in Southern France. Rupestris du Lot is now a good deal used and well spoken of, especially in drier situations. A.R.G.I. is on all sides considered an excellent stock. The vigorous Ohanez seems to suit it well as a scion, and no trouble with suckers was complained of. On the whole A.R.G.I. appears to me to be the most promising stock of the three.

Strange to say no other stocks seem to have been tried. Almeria soils are no doubt "easy" ones and growers have apparently been satisfied with the three stocks above mentioned. They have not, owing to unsatisfactory results, been compelled to seek for better stocks as has so often been the case in other districts. Subsoiling is carried out very thoroughly. The removal by blasting of the layer of hard limestone already referred to is a case in point. The quality of the fruit borne by the grafted vines seems to be quite the same as that on the old vines, nor have the keeping qualities, and especially the resistance to the growth of mould, been impaired in any way. One grower told me that he had noted a slight modification in the fruit of his grafted vines. In his opinion, the berries were not quite so oblong, and the bunches were rather smaller, but the commercial value was not altered in any way. This difference appears to be confined to vines grafted on Riparia stock, and is probably the result of the tendency towards increased fructification which is characteristic of this stock.

THE OHANEZ GRAPE.

Though several different grapes are to be met with near Almeria the Casta de Ohanez or Uva de Lonja is by far the most important. It is this vine and the extraordinary carrying and keeping quality of its fruit that has led to the establishment of the shipping industry for which Almeria is now so well known.

Some confusion seems to exist as to this variety and in other countries one occasionally comes across vines in different places under the name of Almeria which have nothing in common with the true Ohanez.

A good many authentic vines of this valuable variety have recently been introduced and distributed by the Department of Agriculture, and no doubt it will prove of value in several of the warmer parts of the State. In the cooler portions it would not ripen properly, as it is a very late grape—as much later than the Gordo Blanco as that variety is later than the Chasselas. In addition it possesses two other peculiarities which must not be lost sight of by intending planters. It requires extremely long pruning. The fruit-bearing eyes are situated some distance from the base of the canes. If pruned to short spurs it will prove practically sterile. Several long rods, with an occasional wood spur to enable the shape of the vine to be maintained, are the basis of the method of pruning applied to it. Another difficulty is due to faulty pollination. According to some its own pollen is sterile. It is certain that the flower is not a perfect one; the stamens are short, and under natural conditions the abortion of a large

percentage of the flowers is the rule. This renders artificial fecundation necessary, and Almeria is one of the few localities I visited where artificial fecundation is one of the ordinary vineyard operations. A wild Vinifera bearing male flowers known as Flor was largely grown in former times to supplement the deficient pollen of the Ohanez.

Another table variety known as Castiza, which produces red grapes, was pointed out to me as being used for this purpose also. The flower-bunches of the Ohanez are lightly touched with the bunch of the pollen-bearing variety, which must of course be in full bloom. Sometimes the pollen is collected and applied with a small feather duster. It would appear that the pollen of the Ohanez itself is not so valueless as is sometimes stated, for very often fecundation is insured by merely lightly touching the bunch with a soft feather, or even with the hand when in flower. The same result is sometimes obtained by violently shaking the whole plant in order to distribute its own pollen more completely.

TOP OF A PARRA SEEN FROM BELOW.

Bees are scarce in the neighbourhood, owing to the absence of flower bearing vegetation on the barren hills. No doubt if they were plentiful they would greatly assist. In Victoria we may not have the same difficulty to overcome. This peculiarity of the Ohanez is nevertheless worthy of serious consideration for artificial fecundation as practised in Southern Spain would scarcely be possible with us, at any rate, on a large scale.

TRAINING AND PRUNING.

The system of training the vines on high overhead trellises or parrales (singular, parra) is most characteristic, and gives a great charm to the vineyards. The vines are planted in squares at about 15 x 15 and trained with a straight stem to a height of 7 feet or so. At the top of this stem the crown branches out in all directions like a huge spider, the main branches and annual rods being supported by a network of wires crossing

one another at intervals of about 20 inches. The rods to the number of 10 to 15 vary from a foot to 6 feet in length according to the strength of the vine. The system will be readily understood from the photographs reproduced.

The posts and wires are expensive, the former especially, owing to the great scarcity of timber. Sometimes iron piping is used instead of wooden posts. The establishment of a vineyard is estimated to cost from £60 to £80 per acre, including the grading of the land; and, judging from what I have seen, it is difficult to see how the work could be done for less. Returns, however, are abundant. The yield of the Almeria vines, when properly cultivated and irrigated, is usually from 7 to 10 tons of grapes per acre (Richter).

IRRIGATION.

The land is all most carefully graded into plots of various sizes according to its slope; each plot is surrounded by a small dam for irrigation, which is always applied by flooding. The water must be carefully applied, and especially not too near the ripening season, or the quality of the fruit, and more particularly its carrying quality, will suffer. Winter irrigation is largely practised. Care is taken that the subsoil gets a good soaking either from rain or irrigation. In a normal season one summer watering is given in the month of June (December in Australia)—should the season be an exceptionally dry one two summer irrigations are given, one in early June and the second a month later. Large sums have been spent in providing storage basins for water. In some places dams have been made across blind gullies where water is caught and retained for summer use.

CULTIVATION.

This is usually done by bullocks, the Roman plough being the instrument used. There is ample room under the trellises for the plough and the bullocks though a tall man would have to stoop slightly. One wonders why the "parrales" are not built 6 inches higher.

One deep winter cultivation is practically all the vines receive. A light harrowing is given after irrigation. From the 15th of August to the vintage the soil is not touched. An idea seems to prevail that interference with it during this period would have a prejudicial effect on the quality of the fruit.

Manure is applied, but not in large quantities; over manuring and over cultivation are alike held to reduce quality. Though richer soils yield heavier crops, it is poor deep soils which produce the best grapes.

Summer pruning.—Disbudding is practised, most of the shoots without fruit being removed. Those bearing fruit are stopped back. Cincturing such as we know it is not practised, though a form of it known as *Capar las Parrales* is sometimes practised. This consists in removing a narrow ring of bark on the shoot of the current year beyond the bunches. It is strange that ordinary cincturing has not been tried; with a variety so prone to faulty setting of its fruit, good results could no doubt be obtained from it.

GATHERING AND PACKING.

The fruit is usually gathered rather on the unripe side; it completes its maturity in the granulated cork or "serin" in which it is packed. The grapes ripen about October, but packing goes on from about the middle of October until Christmas.

The packing is in barrels made of thin oak, chestnut and pine according to the quality of the fruit, the best being put up in oak. The standard size of the barrels is 22 in. stave x 12 in. at the bung. They contain about 50 lbs. nett of grapes, the gross weight being 77 lbs. At the time of my visit these barrels were worth 2.50 to 3.25 pesetas according to the kind of timber. The cost of landing a barrel in London or Hamburg is estimated to be between 6.20 and 6.50 pesetas, inclusive of barrel serin (cork) freight &c. A smaller barrel containing 25 lbs. nett of grapes is also used but not nearly so extensively as the larger one.

BARRELS OF GRAPES READY FOR SHIPMENT.

The granulated cork is put on the bottom of the barrel and the grapes, from which any damaged berries have been carefully removed, are packed in, about three layers of cork being placed at regular intervals and well shaken through. A final layer of cork is placed over all, and the head fitted in. Packed in this way the grapes will stand a great deal of knocking about; they are said to remain practically unchanged from four to six months. The photograph shows a stack of barrels in one of the sheds on the Almeria wharf ready for shipment.

The Jijona Fresh Grape Industry.

Jijona is, after Almeria, one of the most interesting of the localities where shipping grapes are grown in south-eastern Spain. The methods of growing the vines differing somewhat in the two places, a brief description of some of the points peculiar to Jijona may prove of interest. Want of time prevented me from visiting the locality, but it is fully described by M. Richter in Vialla and Vermorel's *Ampelography*, and more recently, 17th November, 1907, by M. Ravaz, in *Le Progres Agricole*. From these sources I have taken the following notes:—

Jijona is a small town situated about 15 miles from Alicante, and 12 miles from the sea as the crow flies. The vineyards are planted on terraced hillsides, at an average altitude of 2,000 feet above sea level.

The grapes remain on the vines until as late as 19th March—19th September in Australia. They are gathered and shipped as required.

In addition to the Ohanez, another variety known as Valensy is also cultivated. This has been proved at the Montpellier School to be identical with a variety which has long been known in the warmer parts of the south of France, under the name of Panse de Roquevaire. It was formerly largely grown, as a late table grape, on terraced hillsides near Roquevaire, but since the destruction of these vineyards by phylloxera they have not been replanted.

The Jijona method of training is entirely different to that of Almeria. The vines are planted near the edge of each terrace, and are trained horizontally on a short trellis of wood and wire which projects for a couple of feet over the terrace immediately below. At the end of the summer, the long canes, hanging down in front of the trellis like a curtain, are gathered up over the top of it so as to expose the fruit to the sun and air. A certain quantity of brushwood and straw is placed over the top, and under this rough kind of thatch the grapes protected from rain and weather remain in perfect order during the winter. The grapes, packed in baskets and barrels, are shipped to different parts. Marseilles, France, receives annually about 300 tons between October and the end of the year.

The Valensy and Ohanez grapes have recently been introduced into Victoria by the Department of Agriculture. If suited to our soil and climate, there should be enormous possibilities in the way of shipping their fruit in the fresh state.

THE ORCHARD.

James Lang, Harcourt.

The recent beneficial rains will do incalculable good to crops of all kinds throughout the State. Matters were beginning to assume a very serious aspect owing to the protracted dry weather; however, the situation has been considerably relieved, and with a few good rains later on good crops will be quite assured. Pruning and planting operations being finished, ploughing over the orchard should now receive attention, the ground being in good condition for the work, which should be pushed on until completed.

SPRAYING PEACH AND APRICOT TREES.

Peach trees will require continual attention for the black aphis; and should curl in the leaf make its appearance, they will require to be sprayed with Bordeaux mixture.

Apricots, also, should the shot hole fungus appear, will require to be sprayed with the same mixture.

APPLE SCAB.

In districts where the scab on the apple (*fusicladium dentriticum*) is prevalent, the trees will require to be sprayed with the Bordeaux mixture. The best time to do so is just before the flower bursts open, experience having proved that the spray is more effective in destroying the spores at this time.

GRAFTING.

Old trees that have been headed back should now be grafted. The simplest and best method of doing so is by the rind or bark graft, which is performed by cutting the branch straight across and smoothing over with a sharp knife; then cut an incision through the bark for about an inch and a quarter in length down the branch or stock, raise the bark a little on each side of the cut, and insert the scion, which should be cut with a long slope about an inch and a half long, under the bark of the stock; bind round with a bandage, and wax over to exclude the air. This method of grafting very seldom fails if the scions are in proper condition. To make the grafting wax, take equal parts of tallow, beeswax, and resin; melt altogether in a pot over a slow fire. It is then ready for use. It requires to be applied to the graft while it is warm.

SPRAYING FOR CODLIN MOTH.

Spraying for the Codlin Moth will soon engage attention. Arsenate of lead is now acknowledged to be the best spray, as it seems to stick and last longer on the trees than the other sprays. The way to prepare it is as follows: boil 1 lb. of arsenic and 2 lb. washing soda in one gallon of water for about twenty minutes; then put 7 lb. acetate of lead in a bucket with 2 gallons of warm water to dissolve. In using, take one quart of the arsenic liquid, and two quarts of the acetate of lead liquid, mix together and put into the cask of the spray pump with 80 gallons of water.

It was observed last season that an unusually large number of the codlin moth grubs entered the apple from the eye; and, later in the season, round the stalk. This could be remedied in a great measure by a thorough spraying just after the petals fall from the flower, and before the calyx closes up. This spraying should be done with a strong pressure from the pump. If the flower is examined it will be seen that the stamens stand up all round the calyx like a brush, and it requires strong pressure from the pump to force the spray into the calyx. A light spray does not penetrate the calyx at all, but merely damps the outside; therefore, put as strong pressure as possible into the first spraying to make it effective.

As the period of blooming of the different varieties of apples and pears extends over a period of at least three weeks, it will be necessary, if good work is to be done, to make a note of the varieties that are in bloom at the same time, so that the spraying can be done just at the right time. Many growers wait till all the trees are done blooming before they spray, with the result that the first spraying does very little good. Always spray on time for the first spraying with the different varieties; much better work is then done, as the destruction of the grubs at this stage means a considerable reduction later on.

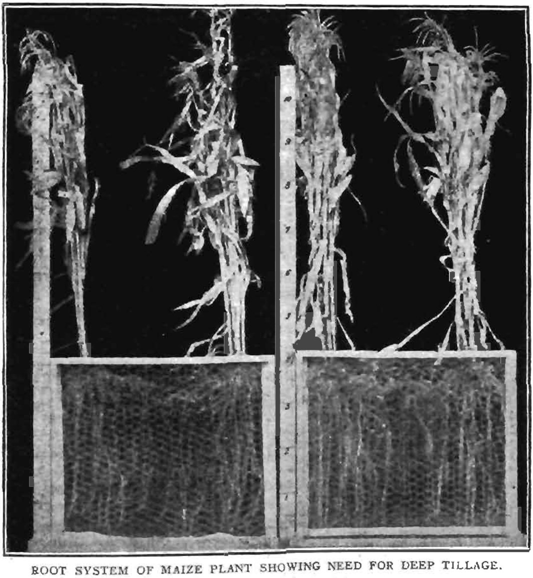
All cases that have been used about the orchard should be collected and scalded in boiling water to destroy any grubs that may be harboring in the joints of the cases; or they should be put into the fruit room, and the room kept continually closed so that the moths when they hatch may not get into the orchard. The moth commences to hatch the first week in October, and continues till the first week in January, before the first brood are all hatched. It is during the first and second week in November that the greater number of the moths hatch, so that if the first spraying about the middle of October has been effectively done, the second spraying can be done the second week in November.

MAIZE FOR FODDER.

The Benefits of Cultivation by "Listing."

C. K. Harrison, Dairy Supervisor.

The subject of drill-sowing of maize has been dealt with extensively from time to time in the columns of the *Journal*. Much good has resulted, and inter-drill cultivation is common in most parts of the State, the area of drill-sown maize being gradually increased each year. There are, however, still some phases of the question not yet touched upon which suggest the probability of the successful growth of maize for fodder in the dry districts of Victoria where it has not yet been satisfactorily grown.



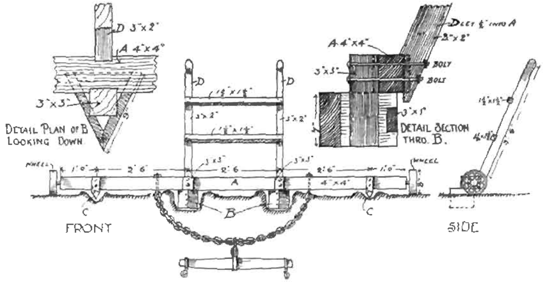
ROOT SYSTEM OF MAIZE PLANT SHOWING NEED FOR DEEP TILLAGE.

Maize and moisture are by most farmers coupled together, and rightly so, too. To keep the moisture, which falls mostly during the winter and spring months, in the soil, it is essential to plough and subsoil the land at once and allow it to remain fallow. An occasional harrowing will not only keep down the weeds, but conserve the moisture as well. The subsoiling can be done by removing the mould-board from a single-furrow

plough, and following in the furrow of an ordinary single plough, tearing up the soil as deep as possible. There are several subsoiling attachments for ploughs on the market.

The illustration on page 555 shows the necessity for deep tillage for maize, the visible roots in some cases penetrating to a depth of four feet.

The land should be lightly ploughed and harrowed about the end of August, and got in readiness for spring planting by opening up furrows or "lists" as they are termed in America, about 2 feet 6 inches to 3 feet apart, 3 to 4 inches deep, and 4 to 6 inches wide at bottom. They should run east and west across the paddock, the object of this being to avoid late frosts. The seeds being planted with a drill in the bottom of the lists 2 inches deep, the frosts, coming as they do from the north, will not check the plants, even if 2 or 3 inches high, on account of being protected in the furrow, and consequently below the surface of the ground.



HOME MADE "LISTER."

A. Piece of sawn timber, 4 in. x 4 in. x 9 ft. 6 in.
B. "Lister," made out of piece 3 in. x 3 in. x 10 in., let in ½ in. to A, with two pieces of red gum board 6 in. x 1 in. x 9 in., and brought to a point (see section of B) and securely screwed and let in to 10-in. piece, which should be bevelled slightly to allow of tight fit. D is also let into A ½ in. with 1 in. out of D, and fastened by means of a cogging joint, and A, B and D fixed with 7-in. bolt in fitting handles D. They should have a slope backward towards the operator of about 25 deg. to avoid operator kicking bar A while at work.
C is a marker fixed to A by bolt.
F is piece of chain for hauling the machine fixed by means of a staple or "eyed" bolt under or at bottom of A.
Wheels.—Old plough wheels can be used.

The lists can be made with a plough, potato-hiller, or moulder, or better still, with an implement like the one shown on this page. This machine can be made by any handy man on the farm. As soon as the maize is up 2 or 3 inches above bottom of lists, the scuffler or horse hoe should be kept going through the drills about once a fortnight. This hoeing will gradually fill in the earth round the young plant, until at maturity of the maize the list has disappeared and the ground is level.

The advantages of listing over surface planting in the dry parts of the State are many—firstly, conservation of moisture around the plant;

secondly, the root crowns being further below the surface, allow of deeper and closer cultivation without injury to the roots; and lastly, it assists the plants to withstand a spell of dry weather.

Farmers trying experiments with the listing will probably find that the listed maize will not at first come on as fast as surface-planted maize, but as the weather gets hotter it will start to grow vigorously.

STATISTICS.

Rainfall in Victoria.

SECOND QUARTER, 1908.

TABLE showing average amount of rainfall in each of the 26 Basins or Regions constituting the State of Victoria for each month and the quarter, with corresponding monthly and quarterly averages for each Basin deduced from all available records to date.

Basin	April. Amount, 1908.	April. Average.	May. Amount, 1908.	May. Average.	June. Amount, 1908.	June. Average	Total for Second Quarter.	Average for Second Quarter.
	inches.	inches.	inches.	inches.	inches.	inches.	inches.	inches.
Glenelg and Wannon Rivers	0·66	2·33	3·14	2·56	3·74	3·64	7·54	8·53
Fitzroy, Eumerella, and Merri Rivers	1·08	2·52	3 31	3·13	4·50	3·86	8·89	9·51
Hopkins River and Mount Emu Creek	0·44	2·37	2·62	2·45	3·25	3·23	6·31	8·05
Mount Elephant and Lake Corangamite	0·29	2·19	2·27	2·33	2·95	2·95	5·51	7·47
Otway Forest	1·41	3·64	3·98	4·51	6·18	5·09	11·57	13·24
Moorabool and Barwon Rivers	0·28	2·35	1·75	2·55	2·65	2·85	4·68	7·75
Werribee and Saltwater Rivers	0·52	2·41	1·26	2·56	2·31	3·05	4·09	8·02
Yarra River and Dandenong Creek	0·49	3·15	2·06	3·33	5·57	3·67	8·12	10·15
Koo-wee-rup Swamp ...	0·44	3·41	2·06	3·73	5·23	3·81	7·73	10·95
South Gippsland	0·96	3·61	3·17	3·71	4·31	4·56	8·44	11·88
Latrobe and Thompson Rivers	0·44	3·24	1·99	3·49	4·32	3·69	6·75	10·42
Macallister and Avon Rivers	0·29	2·86	0·40	2·10	1·12	2·46	1·81	7·42
Mitchell River	0·47	3·34	0·59	3·14	1·16	2·61	2·22	9·09
Tambo and Nicholson Rivers	0·78	3·01	0·50	2·70	1·42	2·71	2·70	8·42
Snowy River	1·63	4·04	0·84	3·14	3·66	4·45	6·13	11·63
Murray River	0·82	1·80	1·55	1·95	3·52	3·20	5·89	6·95
Mitta Mitta and Kiowa Rivers	1·23	2·38	3·14	3·13	4·98	5·29	9·35	10·60
Ovens River	0·58	3·04	3·35	3·54	6·34	6·36	10·27	12·94
Goulburn River	0·15	2·05	2·43	2·41	4·97	4·00	7·55	8·46
Campaspe River	0·03	2·12	2·38	2·66	3·70	3·69	6·11	8·47
Loddon River	0·02	1·73	2·00	1·87	2·78	2·78	4·80	6·38
Avon and Richardson Rivers	0·03	1·53	2·38	1·53	2·95	2·30	5·36	5·36
Avoca River	0·04	1·69	2·18	1·67	2·74	2·74	4·96	6·10
Eastern Wimmera	0·05	2·06	3·46	2·14	3·28	3·34	6·79	7·54
Western Wimmera	0·28	1·86	3·56	1·88	2·50	2·82	6·34	6·56
Mallee Country	0·06	1·27	2·00	1·22	2·07	2·37	4·13	4·86
The whole State	0·43	2·26	2·27	2·35	3·38	3·39	6·08	8·00

R. F. GRIFFITHS,

Acting Commonwealth Meteorologist.

Perishable and Frozen Produce.

Description of Produce.		Exports from the State.		Deliveries from the Government Cool Stores.	
		Quarter ended 30.6.1908.	Quarter ended 30.6.1907.	Quarter ended 30.6.1908.	Quarter ended 30.6.1907.
Butter ...	... lbs.	1,518,720	2,771,296	613,256	911,568
Milk and Cream	... cases	3,930	7,161	..	180
Cheese ...	... lbs.	135,000	249,601	45,800	111,480
Ham and Bacon	... "	525,840	928,800	...	...
Poultry ...	... head	7,014	15,870	1,445	2,438
Eggs... ...	... dozen	420	9,136	27,559	45,549
Mutton and Lamb	carcasses	91,140	30,914	15,659	9,221
Beef	quarters	24	410	20	...
Veal	carcasses	1,039	2,899	419	213
Pork... ...	... "	184	462	136	122
Rabbits and Hares	... pairs	740,202	603,864	168,006	402,972
Fruit ...	... cases	4,045	37,725	2,228	3,582
" Pulp ..	... "	...	654	...	...
Sundries ...	... lbs.	...	...	5,091	27,473

R. CROWE, *Superintendent of Exports.*

Fruit, Plants, Bulbs, Grain, &c.

Goods.	Imports.		Exports.		Goods.	Imports.		Exports.	
	Inter-State.	Oversea.	Inter-State.	Oversea.		Inter-State.	Oversea.	Inter-State.	Oversea.
Apples ...	7,285	—	5,329	4,363	Olives ...	12	—	—	-
Bananas, b/s.	87,362	—	4	—	Peas ...	7,057	—	—	-
Bananas, c/s	7,333	18	233	—	Pears ...	62	—	12,755	9
Barley ..	14,916	629	—	—	Persimmons	268	—	1	-
Beans ...	85	132	—	—	Plants ..	288	285	25	34
Blackberries	3	—	—	—	Pineapples	13,278	—	31	25
Bulbs ...	—	66	7	—	Plums ...	188	—	127	-
Chillies ...	—	206	—	—	Potatoes	46,727	1	—	-
Currants ...	514	250	—	—	Peaches ...	—	—	536	-
Cucumbers	1	—	—	—	Quinces ...	2,710	—	795	
Egg Fruit...	1	—	—	—	Rice ...	—	14,047	—	.
Grapes ...	280	—	3	104	Seeds ...	1,517	7,429	2	.
Granadillas	1	—	—	—	Strawberries	99	—	—	.
Lemons ...	3,606	750	123	814	Tomatoes ...	1,043	—	672	.
Loquats ...	6	—	—	—	Turnips ...	3,877	—	—	.
Maize ...	604	—	—	—	Vegetables	218	—	536	.
Mangoes ...	—	2	—	—	Wheat ..	4,166	—	—	.
Melons ...	20	—	1	3	Yams ...	98	193	—	.
Mixed fruits	3	—	1	14	Dried fruits	—	3,114	—	15,5
Nuts ...	20	4,269	1	—	Fruits in				
Nutmegs ...	10	247	—	—	Liquid ...	—	—	—	6,8
Oats ...	35,428	121,855	—	—	Jams, Sauces				
Oranges ...	46,259	650	87	83	&c. ...	—	—	—	1,1
Passion fruit	1,021	—	102						
Total ...	204,758	129,074	5,891	5,385	Grand Totals	286,366	154,143	21,371	29,6

Total number of packages inspected for the quarter ended 30th June, 1908 = 491,542.

J. G. TURNER, *Senior Inspector Fruit Imports and Exports.*

POTATO EXPERIMENTAL FIELDS. 1907-8.

George Seymour, Potato Expert.

The experimental work in connexion with the potato fields 1907-8 may be stated under the following heads:—

1. VARIETY TESTS.
   - (*a*) To ascertain value of varieties in different localities.
   - (*b*) Change of seed. Seed grown in different soils.
   - (*c*) Immature *v.* Ripe Seed.
   - (*d*) Breeding for Type.
   - (*e*) Sporting of different varieties.
2. MANURIAL TESTS.
   - (*a*) Value of chemical manures when used alone.
   - (*b*) Value of chemical manures when applied in conjunction with farm yard manure.
3. VALUE OF SUBSOILING.

In all 11 plots were planted. Artificial manure alone was applied on the following plots:—Cheltenham, Allansford, Kilmore, Drouin, Neerim, Trafalgar, Trentham, Kinglake and Colac. Artificial and farm-yard manure in combination were applied to two fields:—Romsey and Newlyn.

ARTIFICIAL MANURE PLOT.

5 Chains

	A	B	C	D	E
2 Chains	2 cwt. Super.	4 cwt. Super.	No Manure.	2 cwt. Super. 1 " Amm. Sulp.	2 cwt. Super. 1 " Amm. Sulp. 1 " Potash Sulp.

The weights of manures stated are "per acre."

The Cheltenham plot was of the same area and carried four sections as shown above, the manure dressings being A—3 cwt. bonedust and super. mixed; B—6 cwt. bonedust and super.; C—check section, no manure; D—3 cwt. bonedust and super. and 1 cwt. potash sulphate; E—3 cwt. bonedust and super. 1 cwt. potash sulphate and 1 cwt. sulphate ammonia.

FARM YARD AND ARTIFICIAL MANURE, ROMSEY AND NEWLYN.

A	B	C	D	E	F
20 lds. F.Y. Manure. 2 cwt. Super.	20 lds. F. Y. Manure. 2 cwt. Super. 1 Amm. Sulph.	No Manure.	20 lds. F. Y. Manure. 2 cwt. Super. 1 Amm. Sulph. 1 Potash Sulph.	20 lds. F. Y. Manure.	2 cwt. Super.
Subsoiled Section in Romsey Plot.					

The weights of manures stated are "per acre."

HARVEST RETURNS FROM POTATO

Variety.	J. J. Ryan, Kilmore.					W. Herbert, Neerim.					David Watson, Trentham.				
	A	B	C	D	E	A	B	C	D	E	A	B	C	D	E
Blue Prolific	4.0	3.8	2.5	2.6	3.4	2.5	2.5	1.9	4.6	2.7	..	..	..	..	..
Carman No. 1	6.2	7.1	3.5	3.0	3.7	2.2	2.3	2.5	2.7	2.8	..	..	..	..	..
Duke of *Rothesay* ..	3.3	4.2	2.3	1.8	3.3	..	..	..	..	..	..	..	..	..	..
Brown's River	4.9	4.4	2.9	2.8	3.9	2.5	1.6	2.2	3.9	3.3	3.0	3.4	3.1	4.3	4.2
Tasmanian Red	5.1	4.4	3.3	3.0	4.4	2.4	2.9	2.9	2.6	3.6	3.9	3.2	2.8	3.9	4.3
Up-to-Date	5.4	6.2	3.3	2.8	4.2	..	..	..	..	..	5.3	5.0	4.3	4.7	6.4
N.Z. Pinkeye	3.4	7.8	4.4	3.5	4.2	3.6	3.4	2.5	5.1	3.8	..	..	..	..	..
Orr's Wonder	3.2	6.7	2.8	3.6	5.4	..	..	..	..	..	..	..	..	..	..
Fox's Seedling	5.5	7.8	2.6	3.2	4.1	2.5	3.1	2.5	4.6	3.1	..	..	..	..	..
Black Prince	4.5	6.3	3.3	2.8	3.7	2.2	3.5	1.8	5.9	4.6	3.7	3.9	3.1	4.2	6.8
Delaware	7.0	7.5	3.7	4.7	5.7	..	..	..	..	..	..	..	..	..	..
Daniel's Sensation ..	2.6	6.3	.4	.2	1.9	..	..	..	..	..	..	..	..	..	..
Scotch Grey	3.4	5.1	1.6	2.3	2.9	3.1	3.0	2.5	5.7	3.4	..	..	..	..	..
Copper-skin	5.4	4.8	3.9	2.5	2.9	3.5	3.6	3.4	6.9	4.9	3.2	4.4	3.0	4.7	3.6
Sutton's Abundance ..	..	..	..	..	..	6.2	5.0	3.3	7.6	5.1	..	..	..	..	..
Brownell's Beauty ..	..	..	..	..	..	2.3	2.0	1.7	3.6	3.1	..	..	..	..	..
Bismark	..	..	..	..	..	3.5	2.4	2.4	4.1	3.8	3.0	4.7	2.8	4.8	5.2
British Queen	..	..	..	..	..	1.8	1.9	1.8	3.1	3.3	..	..	..	..	..
Lapstone Kidney ..	..	..	..	..	..	1.1	1.1	.8	3.2	2.1	..	..	..	..	..
Vanguard	..	..	..	..	..	..	..	..	..	..	2.5	5.0	2.3	3.5	3.8
Cook's Favourite	..	..	..	..	..	..	..	..	..	..	4.4	7.1	4.2	7.4	7.8
Brownell's Beauty (Nestors)	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
Brown's River (Local) ..	..	..	..	..	..	..	..	..	..	..	4.6	5.2	3.8	6.1	4.6
Early Rose	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
Snowflake	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
Brownell's (for identification)	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
White Prolific	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
Brownell's Beauty (Local)	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
Clarke's Main Crop ..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
Bresse's Prolific	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
Early Ohio	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
Early Fortune	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
White Rouch	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
Black Manhattan ..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
Nototon Beauty	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
Goulburn Red Skin ..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
Early White Peach Blossom	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
Bovee	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
Thorburn	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
State of Maine	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
The General	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
Carman (No. 3)	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
Beauty of Hebron ..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
Chancellor	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
Early Thoroughbred ..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
Burbank	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
Green Mountain	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
British Queen (Tarwin) ..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
British Queen (Imported) ..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
Cambridge Kidney ..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
Rural New Yorker ..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
Adirondak	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
Orr's Wonder (K) ..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
" " (2) ..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
Schoolmaster	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
Irish Daisy	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
Duke of Albany	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
Lord Tennyson	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
Average ..	4.4	5.8	2.8	2.7	3.8	2.8	2.7	2.2	4.5	3.5	3.7	4.6	4.2	4.8	4.8

Manure Dressings per acre :—A.—2 cwt. superphosphate. B.—4 cwt. superphosphate. C.—No 1 cwt. sulphate of potash, and

EXPERIMENTAL FIELDS—SEASON 1907-8.

W. Burleigh, Allansford.					J. Heatne, Drouin.					J. L. Beale, Kinglake.					T. W. Fish, Yeo.					W. Thompson, Trafalgar.				
A	B	C	D	E	A	B	C	D	E	A	B	C	D	E	A	B	C	D	E	A	B	C	D	E
..	..	..	..	..	..	..	..	..	..	5.5	3.5	1.7	3.2	5.1	..	..	..	..	..	4.3	5.9	5.3	5.9	6.6
..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	5.4	7.3	4.9	5.7	7.9
4.6	6.6	4.1	5.0	6.1	..	..	..	..	..	3.5	3.8	1.9	2.5	4.1	6.1	6.7	5.9	6.7	7.2	6.9	10.3	5.6	7.0	4.6
8.4	8.5	7.3	7.1	7.4	..	..	..	..	..	8.0	7.8	5.1	6.8	7.8	9.0	7.3	8.2	9.1	9.9	8.4	13.8	11.7	12.1	15.9
5.2	5.7	5.7	5.3	7.1	..	..	..	..	..	..	..	..	..	..	9.6	7.1	8.3	7.8	10.5	6.3	9.6	7.4	9.2	10.4
3.0	10.6	3.8	7.1	5.4	..	..	..	..	..	4.9	4.1	1.3	2.3	2.9	5.5	6.3	5.8	7.3	6.8	4.4	7.3	6.7	7.6	8.1
6.1	6.1	5.6	6.6	5.5	..	..	..	..	..	4.5	3.7	1.8	3.1	3.5	6.2	6.8	6.8	7.2	5.6	7.7	11.8	11.0	10.0	9.9
..	..	..	..	..	3.1	3.6	2.7	4.1	5.2	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
..	..	..	..	..	..	..	..	..	..	3.6	2.9	1.3	2.3	2.2	..	..	..	..	..	..	..	..	..	..
..	..	..	..	..	..	..	..	..	..	5.4	5.1	2.5	3.5	4.5	..	..	..	..	..	6.2	9.6	7.9	9.4	9.3
5.2	7.0	5.3	5.5	5.3	..	..	..	..	..	6.2	5.0	2.1	5.0	5.4	6.6	7.8	8.1	7.4	8.4	..	..	..	..	..
6.6	9.1	6.3	7.7	8.7	..	..	..	..	..	6.2	5.2	2.5	4.3	4.9	9.1	7.2	10.8	9.6	10.5	..	..	..	..	..
7.8	8.5	5.8	7.0	6.0	..	..	..	..	..	..	..	..	..	..	6.6	6.6	6.6	6.4	8.1	5.6	7.4	7.6	8.4	9.0
..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	6.4	8.1	7.2	7.2	8.4
..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	6.4	8.7	6.7	7.8	5.7
..	..	..	..	..	..	..	..	..	..	5.4	3.9	2.2	5.5	6.0	..	..	..	..	..	6.0	8.8	4.8	6.0	4.0
..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	2.8	3.8	3.0	3.6	4.2
5.6	5.2	6.3	3.2	4.1	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	5.5	7.1	5.3	5.7	6.9
6.4	6.3	4.8	5.3	5.3	..	..	..	..	..	3.6	3.6	1.7	2.5	2.6	7.5	8.3	7.5	8.8	7.8	..	..	..	..	..
..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	9.0	11.6	14.2	10.8	12.5	..	..	..	..	..
6.4	8.0	5.2	6.4	6.7	..	..	..	..	..	4.6	3.9	1.9	3.4	4.2	8.4	8.0	9.4	9.0	11.0	7.6	11.2	8.9	10.1	10.7
..	..	..	..	..	..	..	..	..	..	6.5	4.6	2.4	4.1	5.3	..	..	..	..	..	..	..	..	..	..
..	..	..	..	..	2.7	2.7	2.0	2.8	2.8	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
..	..	..	..	..	2.8	2.5	1.9	1.9	1.3	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
..	..	..	..	..	.8	.8	.4	1.1	1.1	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
..	..	..	..	..	2.9	2.9	1.7	2.4	2.9	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
..	..	..	..	..	1.9	2.8	1.3	1.8	1.9	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
..	..	..	..	..	3.0	5.0	3.1	3.9	4.2	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
..	..	..	..	..	3.1	3.9	2.4	4.0	3.9	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
..	..	..	..	..	3.1	4.6	2.2	3.9	3.4	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
..	..	..	..	..	1.5	2.0	1.2	2.1	2.9	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
..	..	..	..	..	4.5	6.2	3.0	4.2	4.4	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
..	..	..	..	..	4.2	5.2	2.4	2.9	4.2	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
..	..	..	..	..	4.6	5.4	3.1	3.6	2.3	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
..	..	..	..	..	3.7	4.4	2.2	4.4	5.4	..	..	..	..	..	..	..	..	..	..	5.5	7.4	7.1	9.3	10.4
..	..	..	..	..	3.6	3.6	2.0	4.4	5.7	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
..	..	..	..	..	4.5	5.5	3.0	3.8	3.7	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
..	..	..	..	..	3.4	4.8	3.3	4.1	5.2	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
..	..	..	..	..	3.4	6.1	3.2	2.8	3.1	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
..	..	..	..	..	1.8	2.7	.2	1.5	2.4	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
..	..	..	..	..	2.6	2.9	.7	2.8	3.8	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
..	..	..	..	..	1.6	1.7	.7	1.2	2.1	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
..	..	..	..	..	4.4	4.7	2.2	3.4	3.3	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
..	..	..	..	..	5.3	4.3	2.2	3.0	3.3	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
..	..	..	..	..	.5	1.1	..	.8	2.5	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
..	..	..	..	..	1.5	2.5	1.3	1.6	2.1	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
..	..	..	..	..	4.8	5.1	2.1	3.4	5.6	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
..	..	..	..	..	4.7	5.5	4.0	4.4	3.5	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
..	..	..	..	..	2.5	4.0	3.7	4.2	5.0	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
..	..	..	..	..	1.3	2.2	1.0	1.5	1.9	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
5.9	7.6	5.4	6.0	6.1	3.0	3.7	2.0	2.9	3.3	5.2	4.3	2.1	3.7	4.6	7.5	7.3	8.3	8.1	8.9	5.9	8.6	6.8	7.8	8.2

manure. D.—2 cwt. superphosphate and 1 cwt. sulphate of ammonia. E.—2 cwt. superphosphate, 1 cwt. sulphate of ammonia.

Variety.	Joseph Wedd, Cheltenham.				
	A	B	C	D	E
Goodfellow	1.0	1.4	.6	.5	.3
Lipstone Kidney	1.9	1.4	1.1	1.6	1.4
Carman No. 1	3.2	4.4	3.2	4.6	4.3
Early Rose	2.2	2.6	2.5	2.1	2.2
Windsor Castle	1.9	2.7	2.0	1.9	1.5
Sir John Llewellyn	1.0	1.8	1.1	1.3	.5
Early Norther	5.3	6.5	4.1	4.0	3.1
Rural New Yorker	3.0	4.0	2.9	3.2	2.3
Vermont Gold Coin	4.5	4.6	3.4	3.2	3.0
Uncle Sam	1.5	2.7	2.2	2.1	1.3
Carman No. 3	3.6	4.5	3.0	2.8	3.1
Crines Lightning	3.1	4.4	3.8	2.5	2.8
Average	2.6	3.4	2.4	2.4	2.1

Manure Dressings per acre :—A.—3 cwt. superphosphate and bonedust, equal parts. B.—6 cwt. superphosphate and bonedust, equal parts. C.—No manure. D.—Same as A, and 1 cwt. potash sulphate. E.—Same as D, and 1 cwt. sulphate of ammonia.

Variety.	Robb Bros., Romsey.						Geo. May, Newlyn.					
	A	B	C	D	E	F	A	B	C	D	E	F
Brown's River (Subsoiled)	1.6	1.6	1.1	1.3	1.2	1.4	..	..	..	..	..	..
Brown's River (Unsubsoiled)	1.3	1.7	1.4	.4	.7	1.3	..	..	..	..	..	..
Tasmanian Red ..	1.8	1.8	1.7	1.5	1.3	1.2	..	..	..	..	..	..
Cook's Favourite ..	4.0	3.9	3.4	3.5	3.6	2.3	4.1	4.5	4.2	5.0	5.1	3.6
Up-to-date (Green seed)	5.3	7.1	5.2	6.7	5.8	4.3	5.5	6.6	6.1	6.5	9.8	6.3
Up-to-date (Ripe seed)	3.9	5.2	4.5	5.3	4.5	3.2	5.5	5.0	6.2	6.2	8.6	5.9
State of Maine ..	2.4	2.6	1.8	2.7	2.0	1.8	..	..	..	..	..	..
Carman No. 3 ..	3.3	3.9	2.8	4.3	2.8	1.5	..	..	..	..	..	..
Green Mountain ..	..	2.6	2.5	3.4	2.2	2.4	..	..	..	..	..	..
Vanguard	2.4	1.6	.9	2.2	1.8	1.5	2.7	3.3	3.9	2.7	4.0	2.2
Acme	4.2	4.9	4.4	5.7	5.0	3.7	..	..	..	..	..	..
Black Prince	2.5	2.5	2.5	2.3	2.4	1.6	5.5	5.3	5.2	6.0	6.1	4.2
New Zealand Pinkeye ..	..	..	..	..	..	..	5.4	6.0	5.3	5.2	4.6	4.6
Uncle Sam	..	..	..	..	..	..	5.2	5.3	3.6	3.7	3.0	3.3
Carman No. 1 ..	..	..	..	..	..	..	8.5	8.0	7.0	6.4	9.3	7.6
Beauty of Hebron ..	..	..	..	..	..	..	4.2	4.1	3.6	3.5	3.8	3.1
Adirondak	..	..	..	..	..	..	5.2	4.3	4.6	4.8	5.9	3.6
Brown's River ..	..	..	..	..	..	..	3.9	3.6	3.2	3.8	4.5	4.6
Average ..	2.9	3.2	2.6	3.2	2.7	2.1	5.0	5.0	4.8	4.9	5.8	4.4

Manure Dressings per acre :—A.—15 tons farmyard manure and 2 cwt. superphosphate. B.—Same as A and 1 cwt. sulphate of ammonia. C.—No manure. D.—Same as B, and 1 cwt. sulphate of potash. E.—15 tons farmyard manure. F.—2 cwt. superphosphate.

The character of the soil of the different plots was as follows :—Cheltenham, sand; Allansford, sandy loam; Colac, very sandy loam overlying a clay subsoil; Trafalgar, rich, peaty loam; Kilmore, light volcanic, chocolate; Drouin, gravelly loam rather below medium quality not typical of the best potato soils of this district; Neerim, Trentham and Kinglake soils were similar in character, light volcanic nature typical of much of the forest land along the Dividing Range. These three last named fields were on level ground and even throughout. Newlyn and Romsey were on the rich volcanic soil and as near alike as possible, and may be considered first class potato land.

New Varieties.

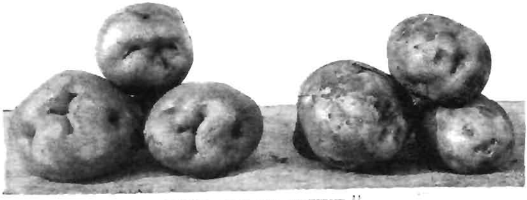
During the last season twenty-six new varieties were introduced. They were mostly small parcels of American varieties. Most of them

were planted in a plot at Mr. Hearn's farm at Drouin. It is to be regretted that owing to the very hot and dry summer the early ones were attacked by the potato grub; consequently only a few of each variety were saved. Nearly all of these varieties had been through exhaustive tests at the Central Experiment Farm, Ottawa, Canada, which embraced 590 varieties and extended in most cases over a period of fifteen years. Of this large number most were discarded on account of inferior production, inferior quality, and other reasons. Among those reported on favourably were:—Bovee, Burbank, Carman No. 3, Early Norther, Early Ohio, Noroton Beauty, Irish Daisy, Vermont Gold Coin, and Green Mountain. All these varieties have, under the most adverse weather conditions, given good results. Early Norther and Green Mountain, which were rejected for inferior production in the Canadian tests, have both done well in the 1907-8 plots, especially Early Norther, which was planted in Mr. Wedd's plot at Cheltenham.

In the test of 590 varieties referred to, 388 were rejected on account of inferior production, though some were fairly productive; 39 for inferior quality; 7 for deep eyes; 5 for inferior quality and deep eyes; 4 for inferior production and deep eyes; 3 for inferior quality, inferior production and deep eyes; one of the disqualifying features in 19 of the varieties was deep eyes, showing how much importance is attached to this feature of the tubers in other countries.

IMPROVEMENT OF VARIETIES BY SELECTION.

Two of the most objectionable features of the New Zealand Pinkeye are the very deep eyes at the crown, and the round shape of the tubers. The latter, with unfavourable weather conditions, renders them very liable to crack and become hollow in the centre. That these faults can be overcome to a large extent has been demonstrated by several growers. These facts were first brought under notice by Mr. Wylie, of Turkeith, who had been a grower at the Warrions in the Colac district; Mr. W. Walter, of Coghill's Creek, in the Ballarat district; and Mr. Morrison, of Springmount, near Creswick. All these growers claim to have had much success in this direction.



"NEW ZEALAND PINKEYE."

Ordinary Type. Improved Type.

There can be no doubt that if this variety can be improved by selection it will go a long way towards establishing its popularity as one of the most useful varieties for early crop. The photographs shown are the second year's produce of seed supplied by Mr. Walter. No attempt was

made during the two seasons to improve them by selection in the direction mentioned. They were purposely left alone, to ascertain whether the elongated type with full eyed crowns was permanent. The two samples were taken from Mr. Herbert's plot at Neerim. On grading, it was found that more than one-third retained the desired type; about one-third were of medium type, showing a decided improvement; while less than one-third had deep eyes. This parcel of seed was well graded to the two types and will be planted next season. It should be mentioned there is a marked difference in the appearance of the plants that produce the two types—those of the objectionable ones being larger and more straggling. The result of future experiments in this direction will be watched with interest.

Immature *v.* Ripe Seed.

The tests of the value of immature as against ripe seed was commenced in the 1906-7 plots with a parcel of Beauty of Hebron seed and were decidedly in favour of the immature seed (see *Journal of Agriculture*, September 1907, page 553.) It might be well to state that what is meant

District.	Immature Seed.			
	Market.	Value at 80/- per ton.	Small.	Value at 30/- per ton.
	Up-to-Date.			
	tons. cwts. qrs.	£ s. d.	tons. cwts. qrs.	£ s. d.
Newlyn	6 9 3	25 16 10	1 18 0	2 17 0
Romsey	6 6 3	25 4 7	16 2 0	1 4 9
" Garden ..	8 4 1	...	..	...
	Vermont Gold Coin.			
Romsey—Garden ...	2 4 2	...	...	...

District.	Ripe Seed.				Difference in favour of Green Seed.
	Market.	Value at 80/- per ton.	Small.	Value at 30/- per ton.	
	Up-to-Date.				
	cwt. qrs. lbs.	£ s. d.	tons. cwts. qrs.	£ s. d.	£ s. d.
Newlyn ...	5 5 1	21 1 0	2 12 3	3 19 9	3 13 9
Romsey ...	4 18 2	19 14 0	0 12 1	0 18 7	5 9 2
" Garden ...	8 0 2	...	...	...	tons cwts. qrs. 0 3 3
	Vermont Gold Coin.				
Romsey — Garden	1 0 0	...	...	...	1 4 2

by immature or green seed is that obtained by lifting the tubers before they have matured and while the plant is still in full vigour. This, it is well known, is contrary to the general opinion of growers, even at the present day, for if the question of what condition tubers intended for seed should be in when lifted be asked the majority of growers would say: "Perfectly ripe and well matured," yet all the experiments in Great Britain go to prove the contrary.

The tests of last season were repeated on a larger scale in the 1907-8 plots. A parcel of Up-to-date seed was lifted in a perfectly green condition, and divided into four sets, two in field culture and two in garden culture; also a parcel of Vermont Gold Coin was dug in a very green condition, being so soft in the skin that it was impossible to gather them without injury. They were allowed to lie on the ground covered with the baulms for a month, when they were quite green and hardened by exposure. This parcel was treated under garden conditions and was entirely in favour of immature seed. The preceding tables show what each parcel yielded. The market value of each crop of Up-to-date, on the basis of 80s. per ton for table seed and 30s. per ton for small tubers, is also given.

From the above it will be seen that the green seed has scored in every instance; also, that green seed at Newlyn produced the smallest quantity of unmarketable tubers and the reverse at Romsey, but in each of the garden tests the immature seed produced the least unmarketable. The returns from Vermont Gold Coin were as follow: 42 sets each planted; one set in each lot unused, leaving 41 plants.

41 Plants, Green.—	20 lbs. very fine table tubers.
	2 lbs. good seed tubers.
	1½ lbs. small tubers.
41 Plants, Ripe. —	9 lbs. medium table tubers.
	5 lbs. inferior seed tubers.
	2 lbs. small tubers.

It must be stated that the garden test of Up-to-date was spoilt through having waste water from the house run down beside the drill of ripe seed by mistake. It was not intended to give them any assistance in the way of irrigation.

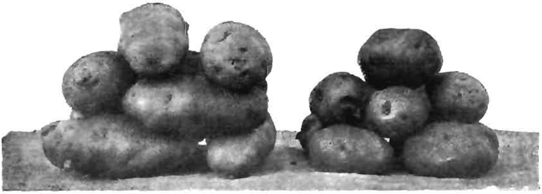
CHANGE OF SEED.

In dealing with the varieties a number of tests were carried out to ascertain the effect on the productiveness of a variety by the change of seed from one district to another. So far the results have been against the theory that change of seed improves the yield. That it is the reverse, at least for the first season, is proved by the last two seasons' operations, especially with the varieties of the Brown's River habit.

It has been the practice in planting the plots to obtain a parcel of locally grown seed which has been planted beside the same variety from another district. In every instance the local seed has given the heaviest gross return in spite of the standard of quality being in some cases very low. The most striking instance of this was afforded by a parcel of locally grown seed in the Trentham plot. Here it gave a gross yield of 4 tons 19 cwt. with only 14 cwt. per acre of marketable tubers, whilst the seed introduced from Mr. Park's plot at Romsey only returned 3 tons 16 cwt. gross with 2 tons 5 cwt. marketable. This was also the case in Mr. Beale's plot at Kinglake.

District and Variety.	A.	B.	C.	D.	E.	Average.	In favour of Local Seed.
	tons. cwt.	tons. cwt.	tons. cwt.	tons. cwt.	tons. cwt.	tons. cwt.	tons. cwt.
Trentham—							
Local	4 12	5 4	3 16	6 2	4 12	4 17	...
Change	3 0	3 8	3 2	4 6	4 4	3 16	1 1
Kinglake—							
Local	5 8	3 18	2 4	5 10	6 0	4 12	...
Change	3 10	3 16	1 18	2 10	4 2	3 3	1 9
1906-7 PLOTS.							
Romsey—							
Local	7 18	8 14	8 4	9 4	7 8	8 5	...
Change	7 16	7 2	5 14	7 4	6 16	6 18	1 7
Koroit—							
Local	7 0	9 14	6 2	8 16	7 12	7 16	...
Change	5 14	9 12	7 8	7 10	6 16	7 4	0 12

In the 1906-7 plots the difference was very marked. Mr. Park's plot at Romsey showed a difference in favour of the local seed of 1 ton 7 cwt.; and Mr. Lane's at Koroit, 12 cwt. The difference in the appearance of the produce was much in favour of the local seed. In all these tests efforts have been directed towards the improvement of the productiveness of the Brown's River, or to discover a variety that would take the place



TYPE OF "BLACK PRINCE." TYPE OF "BROWN'S RIVER."

of that old favourite. The varieties used in this connexion were Black Prince, Blue Prolific, and a variety grown on a small scale in a garden plot under the name of Guernsey Blue. The latter has proved unproductive and lacks quality, and if it shows no improvement next season will be classed out. Of the two former, Black Prince has given the most satisfactory returns, taking Newlyn and Romsey as typical districts for red skins.

The soil of the Neerim and Trentham plots was similar and it will be noticed that there is exactly the same difference in the value of the crop in each place viz. £3 15s. per acre, whilst the difference at Romsey is £4 13s. 6d. This difference is mainly due to the fact that the Brown's River crop throughout the Romsey and Lancefield districts was destroyed by thrip, while the Black Prince was only very slightly affected by that scourge. When grown under favourable conditions the Black Prince is more elongated or kidney shaped than the Brown's River as will be seen by the illustration which represents the best type of each variety from Mr. Herbert's plot at Neerim.

District.	Variety.	Gross Yield.	Weight of Market.	Value at 80s. per ton.	Weight of Small.	Value at 30s. per ton.	Total Value.
		tons. cwt.	tons. cwt. qr.	£ s. d.	tons. cwt.	£ s. d.	£ s. d.
Trentham	Black Prince	4 7	3 3 0	12 12 0	1 4	1 16 0	14 8 0
	Brown's River	3 -	2 5 0	9 0 0	1 2	1 13 0	10 13 0
Romsey ...	Black Prince	2 6	1 19 0	7 16 0	0 7	0 10 6	8 6 6
			Seed only.				
	Brown's River	1 7	0 13 0	2 12 0	0 14	1 1 0	3 13 0
Neerim .	Black Prince	3 -	2 8 0	9 12 0	0 19	1 8 6	11 0 6
	Brown's River	2 12	1 7 0	5 8 0	1 5	1 17 6	7 5 6

NEW ZEALAND PINKEYE v. CARMAN NO. 1.

In the 1906-7 Report reference was made to the value of Carman No. 1 as an early variety as compared with New Zealand Pinkeye. The objection to Carman has been that it will not stand any hardship, and is not a good cropper. The opinion has been gaining ground for some time past that Carman has had its day and is no longer to be relied upon as a cropper; but as to quality, no complaint is made as it is undoubtedly a superior potato to New Zealand Pinkeye.

It is not the purpose of experimental work to advertise any particular variety, but purely to determine in the interests of growers which is best, by dealing with all varieties alike and placing the results before the public. With this object in view Carman No. 1 was tested against N.Z. Pinkeye in the following districts:—Newlyn, Kilmore, Trafalgar, and Neerim. Taking the results of the four plots N.Z. Pinkeye gave the heaviest yield by 6 cwt. of marketable and 1 cwt. small potatoes, but the value of Carman was 10s. to 15s. per ton more. The weights were as follow:—

	Trafalgar.	Newlyn.	Kilmore.	Neerim.
	tons. cwts. qrs.	tons. cwts. qrs.	tons. cwts. qrs.	tons. cwts. qrs.
N.Z. Pinkeye ...	8 5 0	4 2 0	4 14 0	2 14 0
Carman No. 1 ...	5 10 0	4 1 0	6 13 0	2 4 0

The averages of all the four plots are:—

		tons. cwts. qrs.		£ s. d.
N.Z. Pinkeye	...	4 18 0	per acre at 70s.	17 3 0
Carman No. 1	...	4 12 0	per acre at 80s.	18 8 0

The above figures go to prove that Carman is a more profitable variety than Pinkeye in an adverse season. It must be remembered too that in seasons favourable to growth tubers of the latter are unsaleable on account of being hollow.

GEM OF THE SOUTH.

For planting in the Drouin plot Mr. Hearn provided a parcel of Gem of the South grown by him from seed obtained from Mr. Russell Kidd of Tasmania. This potato is similar in appearance and habit of growth to the Brown's River. This seed was planted beside a parcel of good Brown's River as a test of productiveness, and proved superior to Brown's

River in yield and appearance, the cooking quality being about the same. The results were as follow :—

	tons.	cwts.	qrs.	lbs.		£	s.	d.
Gem of the South—								
Table and Seed ...	4	18	1	18	at 80s. ...	19	13	0
Small	0	8	3	0	at 30s. ..	0	13	0
						20	6	0
Brown's River—								
Table and Seed ..	2	17	0	0	at 80s. ...	11	8	0
Small	0	10	3	0	at 30s. ...	0	16	0
						12	4	0

BUD VARIATION AND SPORTING.

Much attention during the past season has been given to this matter; but as no definite conclusions have yet been come to little can be said beyond the fact that many of the varieties on the market at the present time have been originated in such manner. The possibilities of the production of new varieties are almost unlimited. The experiments in this connexion will be carried out on a more extended scale.

A large number of varieties were grouped together in a garden plot for the purpose of observing the habits of growth and tubering of different plants, and also for identification purposes. The separate tests numbered 123. Many of the varieties were sent in by growers wishing to have the proper name of the variety. Much useful information was obtained, but the season was against satisfactory observation as many of the varieties, owing to the dry season, did not bloom; neither was the growth of the plants satisfactory from the same cause.

PROPORTION OF SMALL IN VARIETIES.

One fact has been very clearly brought out by the experiments—that some varieties produce under all conditions a very low percentage of small tubers, whilst others, under the slightest adverse conditions, produce a very high percentage. Among those of the former class Carman No. 1, Carman No. 3, Vermont Gold Coin, Vanguan, Burbank, Delaware, and of the latter Brown's River, Old Pinkeye, and, occasionally, Copperskin and Black Prince. The explanation of this is to be found in two causes; under the first, some varieties have the habit of producing a large number of stolons or underground branches which bear tubers and are consequently heavy croppers under favorable conditions. Others produce fewer stolons and consequently fewer tubers which, having a better food supply, develop a more marketable run of produce. Under the second cause the life of the plant in different varieties varies. Carman No. 1 and New Zealand Pinkeye will, under favorable conditions, produce a crop of tubers in 12 to 14 weeks whereas others require twenty weeks or more. Among the latter may be included the Brown's River family; in the case of the former the tubers are formed and well grown before the latter have well begun tubering. It often happens that just at this critical period a spell of dry weather sets in, the food supply stops, the tubers harden, and should a fall of rain come before the plant dies off it frequently sets up a new growth of leaves and causes a second growth of the tubers resulting in "prongy" or hollow tubers. As the result of this the Brown's River and similar varieties are losing favour with

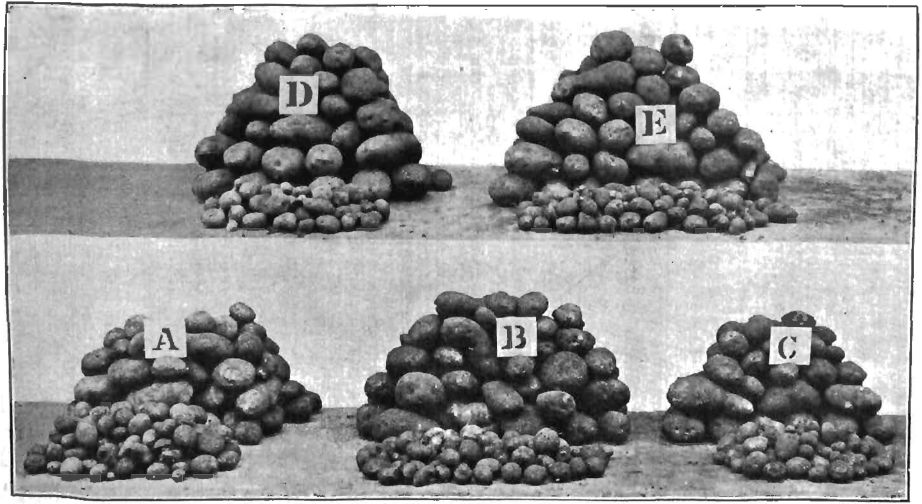


ILLUSTRATION SHOWING PROPORTION OF MARKETABLE TO SMALL TUBERS AND THE EFFECT OF MANURES.
Produce of "Cook's Favourite," Trentham Plot. (Weights of Manures and Yields stated are "per acre.")

A { 2 cwt. Super. Marketable, 3 tons 10 cwt. Small, 18 cwt.

B { 4 cwt. Super. Marketable, 6 tons 6 cwt. Small, 16 cwt.

C { No Manure. Marketable, 3 tons 10 cwt. Small, 14 cwt.

D { 2 cwt. Super. 1 cwt. Ammon. Sulph. Marketable, 6 tons. Small, 10 cwt.

E { 2 cwt. Super. 1 cwt. Ammon. Sulph. 1 cwt. Potash Sulph. Marketable, 6 tons 16 cwt. Small, 1 ton.

growers, many declaring that they will not plant them again. It would be a matter for regret if this old favourite should be given up.

It must be impressed upon growers that to get satisfactory results with this variety, the land must be in good heart. Another point is the necessity of increasing the moisture holding capacity of the soil so as to keep up the growth during a dry period; this condition can be influenced largely by a liberal supply of organic manure, by following a system of rotation which includes pasture, of which clover forms the staple. It is also assisted by proper cultivation and tillage of the growing crop. The following table will give a good idea of the difference in varieties:—

Name of Variety.		Colac.	Drouin.	Kilmore.	Kinglake.	Neerim.	Newlyn.	Romsey.	Trentham.	Averages.
							%	%	%	%
N.Z. Pinkeye	...	29	5	8	..	26	9·5	...	...	18
Carman No. 1	...	...	...	13	...	10·2	7·8	...	...	10·3
" No. 3	..	...	16	..	..	...	...	4·9	...	10·4
Cook's Favourite	..	...	...	.	...	...	...	12	12	12
Vanguard ...	..	...	...	...	.	...	9·2	13	23	15
Brown's River	..	65	19	61	22	46	35	...	51	42·7

Subsoiling.

A section of Mr. Robb's field at Romsey was subsoiled to a depth of 12 inches and was planted with Brown's River seed. The results are not satisfactory, as damage by thrip occurred and no potatoes large enough for table purposes were produced. In the 1906-7 experiment at Mr. Park's the unsubsoiled section gave the heaviest yield, giving 11 cwt. per acre more than the subsoiled section, showing a clear loss, apart from the extra cost, which was considerable. In the present experiment the subsoiling resulted in a slightly heavier yield, and was most consistent throughout all sections.

—	A	B	C	D	E	F	Average per acre.
Subsoiled—	cwt.	cwt.	cwt.	cwt.	cwt.	cwt.	cwt.
Seed only	16	18	6	14	12	14	13
Small	16	14	16	12	12	14	14
Unsubsoiled—							
Seed only	12	18	14	6	6	6	10
Small	14	16	14	2	8	20	12

It should be stated that sections D, E and F were on higher ground than the other portion of the field, and consequently more liable to dry out than the other portion. From the above table it will be noticed that the unsubsoiled sections D, E and F produced very few seed tubers, only averaging 6 cwt. per acre which would seem to indicate that the high land was benefited by the work in a dry season. The crop was so unsatisfactory that no definite conclusions can be arrived at.

RAINFALL.

The rainfall has a material influence on the yield and quality of a crop of potatoes. The plant requires a liberal supply of moisture for its growth, and a constant though not excessive supply during the tubering period. A heavy fall of rain is injurious; one inch spread over a week is more beneficial than twice the quantity in 48 hours. The alternate periods of rain and dry weather did much injury to the crop last season.

The following table gives the monthly rainfall at a number of the plots from September to April. Neerim heads the list with 25.80 inches, Trafalgar being second with 21.15 inches. Kilmore is lowest with 11.47 inches, whilst at Romsey the fall was 12.12. If the heavy fall in December, which was most injurious to the crop at that stage, be deducted from the total fall at Kilmore and Romsey it will leave only a fraction over 7 inches for the growing period, a quantity far below the requirement of the crop.

RAINFALL, SEASON 1907-8.

Name of District.	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.	March.	April.	Total.
Colac	2·13	2·24	1·87	4·54	0·68	0·45	2·45	0·40	14·76
Kilmore	1·31	1·31	1·50	4·18	0·83	0·44	1·63	0·27	11·47
Neerim	4·95	5·29	3·06	7·17	1·24	1·04	2·54	0·50	25·79
Romsey	1·22	1·59	1·50	5·4	·70	·42	1·17	·48	12·12
Trafalgar ...	3·92	4·10	2·41	6·61	·88	·89	1·93	·40	21·15
Trentham ...	1·80	1·29	1·93	3·80	·55	·57	1·71	*Nil*	11·65

The Effects of Manures on Potato Crops.

F. E. Lee, Agricultural Superintendent.

My contribution to this report is limited to the effects of various manurial combinations on the production of tubers, and their influence upon the proportions suitable for table or seed and those which are useless for any other purpose than stock feeding.

From the results of the experiments under review, there appears reason to believe that the character of the manures applied influences the size of individual tubers in a considerable degree. Leaving on one side the inherent characteristics of varieties, which it will be seen in some cases invariably produce a higher ratio of marketable to unmarketable seed, it is of practical worth to the potato grower to know that this ratio is controllable to some degree by means of the manures used.

The experimental crops have been carried out upon a variety of soils, which has influenced the kinds and amounts of manures used according to the locality.

CHELTENHAM (MR. JOSEPH WEDD'S).

From these results, the best yield will be seen to have been produced by 3 cwt. each of bonedust and superphosphate. The proportion of unmarketable seed is also relatively smaller than with any other manure dressing. It is most singular that the addition of potash in section D to the light dressing of superphosphate and bonedust has caused a falling off in yield. Upon the light sandy soil at Cheltenham, potash might

reasonably have been expected to have assisted the other manures. The inutility of potash is most marked in the proportions of marketable and unmarketable tubers in section D. The further addition of sulphate of ammonia in section E, while it has not arrested the falling off in yield, has apparently had some effect upon the size of the tubers.

Section.	*Manure Dressing.*	Quantity.		Quality.	
		Marketable	Unmarketable.	Marketable.	Unmarketable.
		tons.	tons.	%	%
A	1½ cwt. Superphosphate 1½ cwt. Bonedust	1·86	0·81	69	31
B	3 cwt. Superphosphate 3 cwt. Bonedust	2·48	0·93	72	28
C	No manure	1·50	0·97	60	40
D	1½ cwt. Superphosphate 1½ cwt. Bonedust and 1 cwt. Sulphate of potash	1·29	1·29	50	50
E	1½ cwt. Superphosphate 1½ cwt. Bonedust 1 cwt. Sulphate of potash 1 cwt. Sulphate of ammonia	1·14	1·0	53	47

FIELDS AT ALLANSFORD, DROUIN, KILMORE, NEERIM, TRAFALGAR, TRENTHAM, COLAC, AND KINGLAKE.

The manure dressings upon fields in the above localities have been upon conventional lines and the results may be looked upon as answers to direct questions regarding soil deficiencies. The soils were very dissimilar in their natural content of plant foods, and physical condition, prior to the experiment; but any divergence in this direction from the general average is probably reflected in the contrasts shown between the results of individual fields and the average of the whole group.

Name.	Locality.	Marketable.					Unmarketable.				
		A	B	C	D	E	A	B	C	D	E
		tons.	tons.	tons.	tons.	tons.	tons.	tons.	tons.	tons.	tons.
W. Burleigh ...	Allansford ...	4·8	6·3	4·3	5·0	5·0	·8	·8	·8	·7	·8
J. Hearne ...	Drouin	2·3	2·9	1·6	2·2	2·6	·6	·7	·6	·7	·7
J. J. Ryan ..	Kilmore ..	2·9	3·9	1·7	1·6	2·7	1·5	1·6	1·2	1·0	1·3
W. Herbert ...	Neerim.. ...	1·8	1·7	1·1	3·4	2·5	1·0	1·0	1·1	1·1	1·1
W. Thompson ..	Trafalgar ...	4·5	7·1	5·4	6·3	7·0	1·3	1·4	1·6	1·5	1·4
D. Watson ...	Trentham ...	2·7	3·6	2·5	3·8	3·8	1·4	1·6	1·4	1·8	1·9
T. W. Fish ...	Yeo	3·7	4·7	5·6	5·7	6·5	3·8	3·7	2·5	2·5	2·4
J. L. Beale ...	Kinglake ...	3·8	2·7	1·0	2·1	2·5	1·2	1·6	1·1	1·4	1·9
Average of 8 fields ...	...	3·3	4·1	2·9	3·7	4·0	1·4	1·5	1·2	1·3	1·4

In order to render the effects of different manure dressings upon the proportions of marketable and unmarketable tubers more easily understood, the following table shows the percentages of both for each section. The figures clearly show that where potato land is unmanured, as in section C, or insufficiently manured, as in section A, the proportion of unmarketable tubers increases. With better fertilisation, sections B, D and E show progressive improvement.

Section.	Manure Dressing.	Marketable.	Unmarketable.
		per cent.	per cent.
A ...	2 cwt. Superphosphate	71	29
B ...	4 cwt. Superphosphate	74	26
C ...	No Manure	71	29
D	2 cwt. Superphosphate 1 cwt. Sulphate of Ammonia	74	26
E	2 cwt. Superphosphate 1 cwt. Sulphate of Ammonia 1 cwt. Sulphate of Potash	75	25

In this group of fields, the most productive, and at the same time economical, amount of manure has been section B (4 cwt. Super.). Individual fields, notably that of Mr. Herbert at Neerim, show much superior results when nitrogen is added to the light dressing of superphosphate. Mr. Watson's field at Trentham also shows a slight increase in yield in sections D and E over section B. Upon Mr. Beale's land at Kinglake, the light dressing of superphosphate in section A gave the best results.

Reference to Mr. Seymour's portion of this report will show that externally the soils of these three fields were very similar in character. The different action of the fertilisers reveals the necessity for a more complete knowledge on the part of potato growers, and incidentally emphasises the profound value of field experiments.

Fields at Romsey and Newlyn.

Upon the two fields belonging to this group, the relative actions of farmyard manure and artificial fertilisers, singly and in combination, have been tested. The results shown below indicate the marked superiority of the former. In drawing comparisons, however, the reader must keep in mind the fact that a great part of the improved yields from the farmyard manure is due to the greater capacity of soils so treated to hold moisture. It is probable that in this direction farm manure is more serviceable than as a direct plant food. The dominant fact, however, is that the farmyard manure has influenced the yield of potatoes to a greater extent than the dressings of fertilisers; and, as far as the results under review may be accepted, potato growers may safely look upon the figures as demonstrating a principle which the Department of Agriculture has for many years been urging upon their notice. Farm manure not being always obtainable in sufficient amounts may be replaced by crops of peas, beans, vetches or clover, which are subsequently ploughed in for green manure.

Name.	Locality.	Marketable.						Unmarketable.					
		A	B	C	D	E	F	A	B	C	D	E	F
Robb Bros. ...	Romsey...	2·4	2·8	2·1	2·9	2·3	1·7	·5	·4	·5	·3	·4	·4
G. May ...	Newlyn...	3·8	3·9	3·8	3·8	4·9	3·3	1·3	1·1	·9	1·0	·9	1·0
Average of 2 fields ...		3·1	3·3	2·9	3·3	3·6	2·5	·9	·7	·7	·6	·6	·7

The following comparisons are interesting:—

Section A.—15 tons farmyard manure per acre
2 tons Superphosphate ,, ... 3.1 tons
E.—15 tons farmyard manure ,, ... 3.6 ,,
F.—No farmyard manure and
2 cwt. Superphosphate ... ,, ... 2.5 ,,

On Mr. Robb's land, the additional superphosphate in section A produced 2 cwt. per acre more potatoes than in section E, but on Mr. May's land just the reverse was the case.

The above results point unmistakably to the value of farm manure in potato growing, not only for improving the yield, but for increasing the proportion of marketable tubers as well:—

Section.	Manure Dressing.	Marketable.	Unmarketable.
		Per cent.	Per cent.
A ...	15 tons Farm Manure, 2 cwt. Superphosphate	78	22
B ...	15 tons Farm Manure, 2 cwt. Super., 1 cwt. Sulphate of Ammonia	83	17
C ..	No Manure	83	17
D .	Same as B and 1 cwt. Sulphate of Potash...	86	14
E ..	15 tons Farm Manure	79	21
F ..	2 cwt. Superphosphate	78	22

Here again the heaviest fertilisation in section D has given the highest proportion of marketable tubers, thus confirming what was observed in the preceding group of fields.

EXPERIMENTS SUMMARISED.

Some facts stand out prominently as the result of the experiments under review. Where heavy yields of tubers are looked for, the application of light dressings of artificial fertilisers is inadequate. The addition of manures containing nitrogen and potash to the light dressings of superphosphate has increased the yield in the majority of cases; but it has at the same time so enormously increased the cost, that these complete dressings from an economical point of view cannot compare with the cost of the heavy dressings of superphosphate alone. Farm manure alone has shown better results than a light dressing of superphosphate, but it is probable that a heavier application of the latter would more than compensate for the difference. While the use of farm manure is recommended, the fact is not lost sight of that it is not always procurable and moreover entails costly and tedious handling. For this reason potato growers may wish to at least partly replace it by artificial fertilisers. There is sufficient evidence to show that intelligent fertilisation not only increases the quantity of potatoes but diminishes the unmarketable proportion as well. In this connexion I might observe that even as slight an improvement in the proportion of marketable to unmarketable tubers, as 1 per cent., would mean in a crop of 5 tons per acre an additional 1 cwt. for sale. With potatoes at present prices, the extra 5s. or 6s. per acre would contribute nearly one quarter of the cost of the fertilisers found most serviceable. The higher the proportion the less the actual cost of manures.

I am satisfied from my own observation that a great amount of the non-success and low yields in potato growing is due not so much to insufficient or ignorant fertilisation as to indifferent methods of soil preparation. There are few farmers who realise that ploughing, although well done, if carried out at the wrong period discounts the chances of the crop grown upon the land. Fertilisers also cannot be expected to operate to the maximum if the soil conditions are below what they should be. I offer this word of warning because, unfortunately, there are some who believe that any deficiencies of cultivation can be made up by the use of fertilisers. This is not so, and can only inevitably discourage the farmer who attempts it.

The Field Branch projects a continuation of the experimental work with potatoes and hopefully anticipates the solution of some of the difficulties now so manifest through official figures concerning this industry.

A PROLIFIC PUMPKIN.

The prolific nature of the iron-bark pumpkin is well exemplified by the yield of one plant grown by Mr. W. Loveland, of Marong. Twenty pumpkins were gathered, fourteen of which are shown in the illustration. The total yield of the plant was conservatively estimated at 900 lbs., and while the grower is confident that 150 tons to the acre could be produced with the treatment given, he approximates the yield at 120 tons. The plant was grown on fallowed brown sandy loam, which was of fair fertility, and had not been previously cropped. The land was worked to a depth of 14 inches, the surface soil being kept on the top; bonedust at the rate of 6 cwt. to the acre was added. After providing for household requirements the balance of the crop was fed to stock which took to them well. The estimated yield is based on 300 plants per acre.

"The middle one on the lowest row weighed 85 lbs.; the other large ones about 75 lbs.; and the smaller ones about 40 lbs."

LAMB MORTALITY THROUGH TETANUS.

H. W. Ham, Sheep Expert.

Lamb raisers at Elmore, Lara, Rupanyup and other parts of the State have found lambs, from a month to two months old, and mostly wether lambs marked from a week to three weeks previously, dying in the paddocks. One grower at Elmore has lost forty within a few days. They are found lying down, sometimes frothing at the mouth, with eyes turned back and set, limbs very rigid—so much so that if the lamb is placed against a fence it will remain erect. They appear to be in great pain, and grind their teeth. There is no swelling to speak of. They live from two to six days after being attacked. Lambs whether castrated in the old wool-growing style, or by later methods, are all affected alike. If their tails have been seared or taken off by the knife the effect is the same.

Dr. Bull, Bacteriologist, Melbourne University, as the result of his examination of a lamb from Elmore, states that death is caused by tetanus germs, which are more prevalent at some seasons of the year than at others. When lambs lie down, as they always do immediately after castration, they are liable to come into contact with these germs, especially if in old sheep yards, or paddocks where the pasture is short.

Dr. Bull's advice is to use phenyle of the strength of one in forty immediately on castration taking place. A tin containing a good quantity of this antiseptic can be tied to a fence close handy, and applied very quickly in the same way as boys tar cuts at shearing time.

TANNING OF FOX SKINS.

A. A. Brown, M.B., B.S., Inspector of Foods for Export.

The skins should first be treated by sprinking salt over the flesh sides, and allowing them to stand for twelve hours; or, if the pickling method be preferred, immerse them in a strong solution of brine. The next operation is to wash well in cold water and then "flesh" them—that is, remove all fat and other loose tissue. They are then sewn together to form pouches with hair inside, and placed in weak wattle bark solution, made by boiling the bark and leaving the decoction to stand for twenty-four hours before using it. The skins are left in the first bark bath for twenty-four hours then removed and allowed to drain. The strength of the tan is increased by the addition of more of the bark preparation, and the skins replaced. After the lapse of another twenty-four hours, the skins are taken out and allowed to drain. The strength of the tan is daily increased for twelve days more, and every day the skins must be lifted out of the tan and allowed to drain. After the skins are tanned and washed, the leather sides should receive a coat of dubbing. The skins are then thoroughly worked, stretched, and hung up to dry, and the fur cleaned and evenly smoothed out.

Another method of curing skins is to treat them with salt and sulphuric acid. Over two quarts of bran pour five or six quarts of boiling water, and then strain. Make an equal quantity of salt water by putting into water as much salt as it will take up. Mix the bran and salt solutions and to each gallon of the mixture add one ounce of sulphuric acid. Then immerse the skins, stirring them occasionally until tanned. Fox skins will tan in about one hour. When tanned, wash the skins in water, and hang in shady place to dry; when dry, work them well.

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FIFTH PROGRESS REPORT ON VITICULTURE IN EUROPE.

(*Continued from page 553.*)

F. de Castella, Government Viticulturist.

From Almeria to Madrid.

(Via Granada, Montilla, and Manzanares.)

According to my original itinerary I should have proceeded from Almeria to Algeria, but several circumstances led me to alter my plans. The season was now very far advanced (11th December), and the time remaining at my disposal too short to permit a thorough inquiry into Algerian viticulture. To do any really useful work in this important French colony would take a month at least, and I could not afford so much time, for I was anxious to return to France, where there remained several important matters for me to inquire into. I was anxious, for one thing, to discuss with French authorities the preference of growers in Portugal and Southern Spain for field grafting. Besides this, Algerian viticulture is almost entirely based on French experience, and so far as I could learn the methods differ but little from those followed in France.

Being in Spain I considered that I could employ my time to better advantage learning as much as possible of Spanish viticulture, concerning which so little is known outside of the country. I wished to see something of official viticulture, and the way in which the Spanish Department of Agriculture assists vine-growers; also to visit Valencia and inquire into the important Pudding Raisin industry in the neighbourhood of that town. I therefore decided to proceed from Almeria to Madrid, breaking my journey at Montilla and Manzanares, two important viticultural centres to persons in which I had introductions. I had also heard of the fine estate of the Duke of Wellington, near Granada; in order to visit it I made this celebrated old Moorish town my first stopping place.

The railway journey from Almeria to Granada is a most interesting one as the train passes through varied country. The line is very picturesque.

After leaving Almeria, it runs for miles along a fertile valley where luxuriant parrales of the Ohanez vine are the most striking feature of the landscape. Here and there the barren hills close in on either side, leaving no available flat land. Esparto grass grows wild on these hills and this hardy plant then becomes the only vegetation; but as soon as the valley widens at all, once more the parrales appear on the scene. This occurs right up to near Granada; though after Gergal, some 20 miles from Almeria, they cease to be the only form of crop.

GATHERING OLIVES IN SOUTHERN SPAIN.

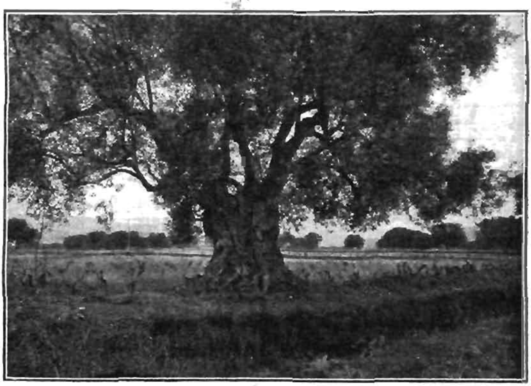
I was informed that some of the best shipping grapes come from Berja, some 40 miles from Almeria. This part of the country is highly mineralized; in fact, it was the shipment of ore from Almeria which led to the construction of the railway line. Mining is in evidence everywhere, and it is chiefly under British control. A huge sign-board on which the words "The Gergal Railway and Mines Coy. Ltd." are painted in large letters appears strange amid such very foreign surroundings. From the Doña Maria railway station, an endless cable line for the conveyance of ore winds its way upwards until it is lost to sight in the snows of the Sierra Nevada range, the high hills of which form a most impressive picture on the left side of the line right on to Granada.

Olive Culture.

Beyond Doña Maria the country opens out a good deal and other forms of agriculture, especially olives and wheat, occupy the cultivated land. The olive is cultivated to an enormous extent in Spain, in many parts of which it is the only tree to be seen. Oil is a necessary of life to the Latin races; it occupies with them quite as important a place as butter does with us. Within the last twelve years its value in Spain has increased by fully 25 per cent., a fact which no doubt accounts for the large number

of young olive plantations which are to be seen everywhere in the southern provinces. Granada possesses over 100,000 acres under olive culture; but it is the adjoining provinces of Sevilla, Córdoba and Jáen which constitute the principal olive region of Spain; between them they have one and a half million acres planted with olives, or almost exactly half the area occupied by this culture in Spain.

When one views these plantations and considers the above figures the question presents itself whether we are right to neglect this useful tree in



A VERY OLD OLIVE TREE.

the way we do, and whether olive culture is not destined, some day, to become one of our important rural industries, especially as it thrives with us as well as in any other part of the world. The few plantations we already possess have abundantly proved this as well as the high quality of the oil we can produce. Both our soil and climate are admirably suited to its successful cultivation. The precious quality it shares with other deep rooting plants, such as the vine, of withstanding long periods of drought renders it worthy of more extensive trial in the drier parts of Victoria. Photographs of some Spanish olive trees are here reproduced.

Winter Irrigation—A Lesson for Victoria.

Another point that made a strong impression on me on the trip from Almeria to Granada was the extent to which winter irrigation is practised. Though it was approaching midwinter, olives, vines, and even wheat were everywhere being watered, usually by flooding, though occasionally by seepage. The great aim of the farmer in the drier parts of Spain is to well soak the subsoil in winter, by irrigation, wherever this is possible. There is no doubt that we could with advantage utilize much of our surplus winter water in the same way.

Granada.

Granada, the capital of the province of the same name, is a fine town of 76,000 inhabitants. It is the centre of a rich agricultural district. The vega, or plain, of Granada, is a wide fertile valley through which runs the river Jenil. The level land is all irrigated. The chief crops are wheat and sugar beet; sugar mills and distilleries abound in the neighbourhood. The land of the vega is very rich; the wheat yield being usually over 40 bushels per acre (irrigated). It is mostly leased to small farmers at an annual rental of from £2 to £4 per acre.

The Duke of Wellington's Estate.

I was well received by the British Vice-Consul, Mr. Chas. E. G. Davenhill, who very kindly gave me a letter to the Duke of Wellington's manager, Mr. Montague J. Mostyn.

La Torre del Molino del Rey is the name of the Duke's estate. This magnificent property, which is situated only a few miles from Granada near the small railway station of Illora, was presented to the grandfather of the present owner by the Spanish nation as a token of gratitude after the close of the Peninsular war. The estate comprises nearly 20,000 acres, a large proportion of which consists of rich vega lands, leased out to small farmers. The poorer lands on the hillsides are worked under Mr. Mostyn's direct management, olive culture being the most important branch on land which cannot be irrigated.

There are 36,000 olive trees, mostly of the Tempranillo variety, on the estate. Eighty trees are planted to a Spanish acre. The olive is considered the most profitable crop for the poorer lands of the estate. Where irrigation is not possible provision is made for the retention of as much of the rainfall as possible by working the ground into a sort of semilunar dam on the lower side of the tree. This small mound is demolished and levelled at the second cultivation. A well-equipped olive mill fitted recently with the most modern machinery deals with the produce of the "olival."

The vineyard is smaller than I had been led to believe, being only about 50 or 60 acres in extent. It is well planted and thoroughly cultivated. I was glad to have an opportunity of visiting a Spanish vineyard under English management. I spent an interesting afternoon with Mr. Mostyn, by whom I was most courteously received.

Before being planted the vineyard was subsoiled 3 feet deep by hand labour at a cost of nearly £40 per acre; the soil is marly and somewhat gravelly. It is situated on the low hills near the sides of the vega. In places it is very limey—some portions proved on analysis to contain as much as 60 per cent. carbonate of lime. The vines are planted at 6 ft. x 6 ft., and are hand cultivated, but it must be remembered that vineyard labourers are here only paid 1s. 3d. per day, and feed themselves.

The variety grown is exclusively the Pedro Ximenes, which here produces a very fair white wine, selling locally when a few months old at about 8d. a gallon. The wine, so far as crushing and pressing are concerned, is made in much the same way as we make our dry whites in Australia.

The stock used is almost exclusively No. 1202. It appears to do remarkably well in this limestone soil.

The vines are formed with crowns of medium height, and are short pruned, a fair number of spurs being left on each vine.

Both field and bench grafting have been tried, the former being the more usual. The overseer informed me that out of 600 grafts done last

year there were only five or six misses. I discussed the question of bench *v.* field grafting with Mr. Mostyn, who seems to be of opinion that both are good, but that field grafting, on the whole, seems to give the best results. It is the more popular method in the district.

Montilla.

From Granada to Montilla is a short journey by rail, though it occupies some hours, a slow branch line joining the main line at Bobadilla. Montilla is a small town nearly due south of Córdoba, from which it is about 20 miles distant. It is widely known for its wine—a true sherry of very high quality. Though only a small district, owing to the limited area of the type of soil on which the best wine is produced, it is a most interesting one as it presents a striking example of the preponderant influence of soil in deciding the character of the wine. Though about 100 miles from Jerez, as the crow flies, and separated from it by country of very different nature, and producing wines of distinct types, the wine of Montilla at once strikes one by its strong resemblance to that of Jerez, so much so that the bulk of it finds its way to England where it is sold as sherry.

The similarity of soil is at once apparent. In a railway cutting near the town one may notice the same soft, chalky, limestone rock which forms the subsoil at Jerez, where it is known as Tosca. The surface soil, likewise, is the same whitish grey soil and at once recalls the Afuera type, though it is perhaps a trifle more clayey. It is on this class of soil that the vine which produce the celebrated Montilla wines are planted. The Sierra de Montilla, and also Moriles, some 7 miles distant, are among the localities which produce the best wines.

Montilla may claim to be the parent of sherry. It has given its name to the type of that wine so universally known as "Amontillado"; this word really means "like Montilla."

In Shakespeare's time the wine so much consumed in England under the name of "sherris sack" was totally different from what we now know as sherry. It was a wine made by partial boiling of the must and was as dark as stout or porter, very similar in fact to the Brown Malaga of the present day. Montilla methods of treating and maturing found their way to Jerez, and the resulting wine, which gradually superseded the sack of former days, became known as Amontillado.

Now-a-days there is practically no difference between the wines of the two places, though Montilla growers claim that theirs possess more bouquet. They are certainly very fine wines, clean, delicate and highly perfumed, but it would need an expert sherry taster to distinguish between the wines of the two places.

Whilst in Jerez I met one of the leading vineyard owners of Montilla, Don Antonio Garcia Toro, and it was his invitation to call on him, on my way through to Madrid, that led me to break my journey in order to see something of this interesting district. I was very cordially received by Don Antonio and it is to him that I am indebted for the information that follows.

Methods at Montilla.

As Montilla and Jerez have so much in common it will be sufficient to describe the points in connexion with culture, wine making and treatment peculiar to the former locality.

The soil is carefully prepared for planting in the same way as at *Jerez. Phylloxera made its appearance a good many years ago, and the*

vineyards have long been reconstituted. Owing to the high lime contents of the soil, questions of adaptation have given a good deal of trouble, and it is only recently that thoroughly suitable stocks have been found. Berlandieri hybrids are preferred to all other stocks and little else is now being planted. The following are the numbers most largely used:—420A, 41B, 33 and 34E, and 157-11. All these seem to give satisfactory results. Though the Berlandieri hybrids make perhaps a little less growth during the first few years than some other stocks, once they are thoroughly established they form a splendid vine and one which is very fruitful. The suitability of these stocks for this climate, which is hot and dry like that of Northern Victoria, points to a great future for these stocks with us.

The Pedro Ximenes is more largely used as a scion in Montilla than in Jerez, in which districts its grapes are chiefly made into sweet wine. In Montilla it enters very largely into the composition of the dry wines, being mixed with the Palomino or Listan and a few other less important varieties. Some excellent sweet Pedro is made in Montilla, but by far the greater part of the wine is dry.

Field grafting is here the rule. Don Antonio is strongly in favour of it, and advanced many reasons for its superiority over the plantation of nursery raised bench grafts. Very long barbados (ungrafted American)—in some cases they are 3 feet long—are planted and subsequently grafted. Both the Yema and Espiga grafts (see 4th Report) are used. The former gives good results, but the latter is more usually practised. The vines are planted at 6 x 6 and short pruned to 5 or 6 spurs. The crowns are rather higher than at Jerez; and, of course, no Horquillas are used. Cultivation is executed by hand with the hoe but the land does not seem to be usually worked into piletas as at Jerez. It is thoroughly turned over to a depth of almost a foot at the winter cultivation and kept loose and free from weeds by summer hoeings.

Crushing, pressing, &c., are conducted in exactly the same way as at Jerez, though rather less gypsum or plaster is added to the grapes on the press.* It does not in fact seem to be always added. Don Antonio informed me that though wine made from plastered grapes cleared more rapidly the addition of this substance is not, in his opinion, indispensable for the production of a high class sherry.

The question of the use of plaster is a large one. It will be dealt with at length in connexion with wine making methods in the Jerez district.

THE USE OF TINAJAS.

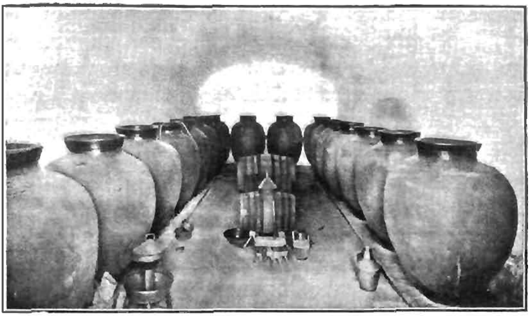
The most notable difference so far as wine making is concerned is to be found in the kind of vessel in which fermentation takes place at Montilla.

Until the first racking the wine is stored in large earthenware jars, somewhat similar to the Amphoræ of Ancient Rome, known as Tinajas. A photograph showing a fermenting room with some almost identical jars, used in the south-east of Portugal, is here reproduced. These Tinajas are very picturesque; they are made of red earthenware and recall the pictures of Ali-Ba-Ba and the Forty Thieves. Tinajas have been used in certain parts of Spain since time immemorial for storing wine and oil. They vary in size and shape according to local customs.

* The use of gypsum or plaster in the making of sherry is one of the features of wine-making at Jerez. The quantity used is somewhat higher than is permitted by our Pure Wine Act. It is usually considered, at Jerez, that the use of plaster is indispensable in order to obtain a wine which will subsequently develop on the lines necessary to produce a high-class sherry.

Those used at Montilla contain from three to four butts (over 300 gallons). Their lower part is buried in the earthen floor of the cellar. The mouth is large enough to enable a man to get in to wash out the vessel. A lid made of wooden boards is used to close them.

Tinajas are made at a place called Lucena, some 25 miles to the S.E., where their manufacture constitutes an industry of some importance. They cost from 75 to 100 pesetas each (£3 to £4 reckoning the peseta at par). After the first racking, which takes place in early winter, the wine is transferred to butts, in which it is reared on the solera system in exactly the same way as in the Bodegas of Jerez.



TINAJAS, IN WHICH THE WINE OF MONTILLA IS FERMENTED.

It is stated by Montilla growers that wine fermented in Tinajas is superior to that fermented in wooden butts. Probably better control of temperatures is responsible for this preference; in the same way that we find cement fermenting vats more satisfactory than wooden ones in Northern Victoria. Montilla is situated inland of the coastal range of mountains, so that temperatures are more extreme than near Jerez.

There being so little difference between this district and Jerez, where I spent some time, I resumed my journey after a short stay and reached Manzanares at an early hour the following morning.

Manzanares.

La Mancha is the name given to a portion of South Central Spain. It is made up of the province of Ciudad Real, and portion of Albacete. It is best known, out of Spain, as the region in which Cervantes laid the plot of his celebrated romance of Don Quixote. To this day one is shown, near Tembleque, the windmill which this legendary hero is supposed to have charged. These mills are a familiar feature of the landscape in this wind-swept, treeless region.

La Mancha forms part of the central plateau—the level portion situated between the Sierra Morena and the Montes de Toledo. The former range separates it from Andalucia. The soil varies a good deal; it is usually stony, in some places very much so, far more than one would expect on such

level land. Occasional expanses of bare rock are to be seen. Deposits of gypsum occur frequently and render much of the land unfit for cultivation. On these poor lands flocks of sheep and goats are grazed. The rainfall is scanty and irregular; taken as a whole it is a sparsely-populated region which possesses a special character of its own.

The principal forms of agriculture, in the order of their importance, are: vines, wheat, barley, olives and oats. Viticulture occupies a very large area; according to the official statistics for 1906 the province of Ciudad Real alone had 332,000 acres under vines. It is, in fact, the province which has the largest area of vineyards in Spain, though Tarragona produces more wine as the average yield in La Mancha is poor. In 1906 it was under 100 gallons per acre, although that vintage was considered a fair one.

The two most important viticultural centres are Valdepeñas and Manzanares. The last-mentioned place may be taken as being typical of the whole of La Mancha. I had when in Malaga been given a letter of introduction to their Manzanares manager by the firm of Jimenez and Lamothe, which owns one of the largest wineries in La Mancha. This induced me to visit Manzanares in preference to Valdepeñas, though the latter is perhaps the better known of the two places.

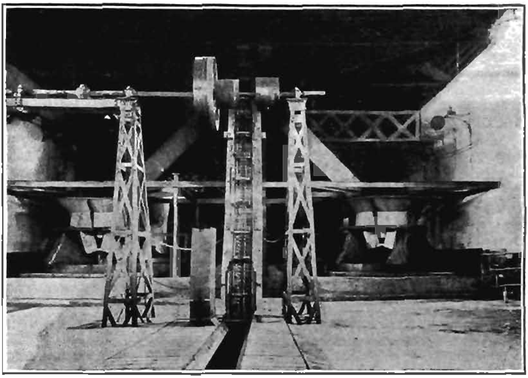
Viticulture in this part of Spain is somewhat different to what one finds in Andalucia, as the vine farmers, or cosecheros, usually sell their grapes to the large wineries instead of making their own wine. The wines of La Mancha are of somewhat nondescript type or rather many different types; vins ordinaires or common beverage wines predominate. This is the class of wine, always consumed from bulk, with which one becomes so familiar in all Latin countries. It is usually sold at a cheap price. Some wines of better class, known as Vino de Mesa, or table wines, are also made. These are bottled and matured before being sold, but they do not constitute a large proportion of the total production. Large quantities of blending wines of very different types are turned out in the large wineries of La Mancha. Among these one finds the full bodied dry white used in Jerez for blending in with the cheap sherries. Also, what may be termed *basis wines*, for the making up of different types of sweet wines. Such are *Arrope* or boiled grape juice; much the same as what we erroneously term Geropega in Australia; *Mistela* or grape juice the fermentation of which has been prevented by fortification immediately after it has been extracted from the grapes; *Vino Ahogado*, a fortified sweet wine; and *Vino Azufre*, a sweet wine in which complete fermentation has been prevented by heavy sulphuring. Much fortifying spirit is also produced; most of that used in Jezez, Malaga, and Montilla being distilled in this part of Spain.

It would be difficult to find a type which is not included in the wines turned out by any of these large wineries. That of Messrs. Jimenez and Lamothe was the only one the limited time at my disposal permitted me to visit. It is exceedingly well equipped, and capable of dealing with 145 tons of fresh grapes in a day. I was treated with great courtesy by the manager, with whom I spent a most interesting morning in visiting this extensive establishment, the largest of the kind I had so far seen in Spain.

A Spanish Winery.

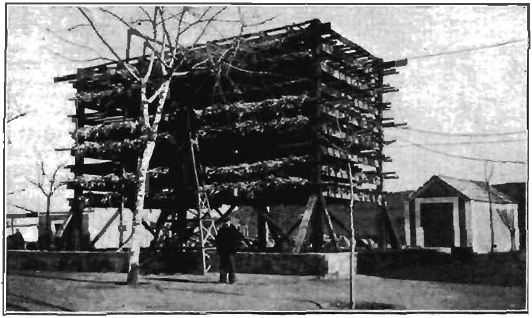
In the photograph reproduced is shown the receiving room where the grapes are emptied out on to a carrier which conveys them to the elevator, from which they fall into two crushers, one on either

side, of a design I had not previously seen—something after the style of a Chilian mill for crushing olives, or a butter



RECEIVING ROOM, ELEVATOR AND GRAPE CRUSHERS.

washer. Very complete crushing of the grapes is a condition which is always aimed at in Spanish wineries. From these a second elevator takes the crushed mass to a continuous press of peculiar design formed of two rotating plates of special shape which laminate the crushed grapes and



WATER COOLER AT MANZANARES.

deprive them of the greater part of their juice. From this press the marc goes on to a series of hydraulic presses, working at a pressure of 250 atmospheres (3,750 lbs. to the square inch) where practically all the juice is extracted from it. Such is the treatment of the grapes for the making of

white wine, a far larger quantity of which is turned out than of red. If red wine is to be made the grapes go from the crushers to a stemmer, and thence to the fermenting vats. The red wine, which has a strength of about 25 per cent. proof, is fermented in small wooden vats, capable of yielding 300 or 400 gallons of wine each. The marc is well rummaged twice a day, but no special means are employed to control temperatures. The wine usually remains a week in the fermenting vat.

A large and splendidly-equipped distillery is one of the features of the establishment. Both brandy and fortifying spirit are distilled. The marc is distilled in a special still with three tipping boilers which work in rotation, and in which it is deprived of its spirit by steam being rapidly blown through it. Each boiler can take a charge of 2 cwt. of marc. It takes fifteen minutes for the extraction of the alcohol. Brandy is distilled in pot stills. Water being scarce in La Mancha, the refrigeration of the warm water from the condensers is necessary. This is carried out in a simple cooler of large dimensions, as shown in the photograph. It is made of vine cuttings fixed in a large iron frame. The water trickling slowly over these is rapidly cooled; one passage over this appliance reducing the temperature from 176 deg. to 59 deg. F. Nothing is wasted in this winery; the lees are pressed, dried and sold for the extraction of cream of tartar. Even the marc is, after distillation, dried and converted into what is termed Orujo Testado to serve as fodder for farm animals.

All machinery is driven by a couple of engines, one of 14 and the other of 20 horse-power.

Electric light generated on the premises is laid on everywhere so that work may be continued night and day. Such is a very summary description of this fine winery, one of the largest of its kind in this part of Spain.

The price paid to farmers for their grapes varies a good deal; last season from .70 to 1.50 pesetas per arroba was given for white and up to 3 pesetas for red grapes, which were scarce. This would be equivalent to £2 to £5 per ton for white and up to £10 per ton for red.

The vineyards are laid out on the square system, the vines being 6 or 7 feet apart in each direction. Ploughing by animal traction is now the rule in La Mancha. The vines are trained with low crowns, and are pruned very short. They are not tied up or staked in any way.

Invasion by Phylloxera Inevitable.

So far as reconstitution is concerned there was nothing to be learnt in this region, for it is as yet free from phylloxera. It constitutes a clean island surrounded by infested districts. Here, as in so many other places, where growers have not yet had experience of the pest, one is told that in the special soil of the district phylloxera will not be able to injure the vines. As the soil is not of a sandy nature, it is difficult to find any justification for such hopes.

Phylloxera is even now on the borders of La Mancha, and it is highly probable that within a very few years it will be right through the district. The inevitable destruction of such a large area of vineyards, which will in all probability be only slowly reconstituted, owing to the low prices now ruling for cheap wines, will probably have a beneficial pecuniary effect on the Spanish wine market generally.

Other important regions in Northern and North-Eastern Spain are only now beginning to feel the effects of phylloxera, and it is very probable that within a few years the wine production of the whole country will show a considerable decrease.

INSECT PESTS IN FOREIGN LANDS.

Eighth Progress Report by Mr. W. W. Froggatt, F.L.S., F.E.S.

R.M.S. *Omrah.*

I reached Bombay on the 29th May, 1908, and at once called upon the Colonial Secretary, who gave me letters to the Acting Director of Agriculture at Poonah, to which place I went the following day. After getting some information from him, I drove down to where the new Agricultural College is being erected and met Dr. H. H. Munn, who after being scientific adviser to the tea planters of Ceylon, has been appointed principal. I returned the following night to Bombay, and an hour later took the night mail to Calcutta to Waine Station, the nearest point to the Imperial Research Laboratories at Pusa, Bengal. On the road I received a telegram from Mr. Howlett (second Imperial Entomologist) saying he would meet me at Allahabad, where he was investigating fruit flies. I met him at the junction at midnight, and we spent the next three days around Allahabad, Cawnpore and Lucknow in orchards and melon fields. Then we parted company, and I went north to Dehra Dun and Missorie to see Mr. Stebbing, the Entomologist of the Indian Forestry Department, but though I met other officers of the Department, Mr. Stebbing was away on tour. I then returned, travelled all Sunday night, and met Mr. Howlett at Mogul Seria on Monday evening, and reached Pusa at six on the Tuesday morning.

Here I spent five days working in the laboratories with Messrs. Lefroy and Howlett, and collecting and breeding fruit flies in the peach orchard, among the mango trees, and in the melon fields. On the 16th July, accompanied by Mr. Howlett, who has been specially sent out to Pusa to study the habits of biting flies and diptera generally, I left for Calcutta, which we reached on the following day, and spent the afternoon going through the collections with the curator, Dr. Annandale. Leaving late the same evening for Bangalore *viâ* Madras, which we reached early in the morning of the 20th, the Director of Agriculture at Madras sent the entomological assistant on his staff with us, and Mr. Ayer proved a very useful guide and interpreter to us while in the State of Mysore where we collected a great number of fruit flies in all kinds of fruits. Though the season was practically over we obtained maggots on nearly all the fruit.

Though in the course of their investigations on Northern India after breeding out some thousands of fruit flies only three specimens of a parasite have been bred, in Bangalore Mr. Ayer finds at least three small braconid wasp parasites in the fruit fly pupæ that infest the guavas that ripen in October and November, but at the same time he estimates them as only reaching 12 per cent. of the flies, and has never obtained any parasites from pupæ taken from mangoes, oranges or peaches.

All the nurserymen agreed that all their guavas have been destroyed for the last six years with fly maggot. I therefore hold out very little hope of this being an effective parasite in Australian orchards, if it cannot check the ravages of the fruit fly in its native haunts, but if any of the Department's of Agriculture interested want to obtain these parasites a number could be obtained at a very small cost.

I have enlisted the services of the Imperial Entomologist and his assistants to take up the matter, and the Director of Agriculture for Madras will lend his native assistants, who are trained entomologists, and if so instructed would collect and forward, *viâ* Colombo, parasites and pupæ this coming season.

Returning to Madras on the 25th June, I parted with Mr. Howlett, who had given me much valuable assistance, and started for Ceylon *viâ* Tuticorn the same evening, reaching the boat the following evening and landing in Colombo early next morning (Saturday 27th).

After calling at the Agricultural Society's offices and the Chemical Branch of the Botanical Gardens Station, I left for Peradenyia the same afternoon, and spent the two following days at the laboratories of the Royal Botanic Gardens examining the collections and collecting fruit flies. Then with Mr. West (Acting Entomologist) I went across to the south-east of the island among the tea plantations, where I found that fruit flies were common in the garden fruits later in the season. Returning the next day, I met the director of the R. B. Gardens who advised me to visit the great mango district of Jaffna in the north of Ceylon, and he wired to the Resident of the district to place his officers at my disposal while there.

Reaching Jaffna late the following night, I was met by Messrs. Mattahumura and Chelones, who arranged everything for me until I left. In the morning we drove through twenty miles of palm groves and cultivated lands, and though the season was late, and there was not much fruit about, I found any amount of fruit fly maggots in the melon fields, from which I have since bred a fine series of a large fruit fly, allied to *Dacus curcubita*. On my return to Colombo I spent the morning with Dr. Wiley at the Museum and examined his collections.

The Mediterranean fruit fly is not found in India or Ceylon, though I found specimens in the collections at Cairo. All the fruit flies in the latter countries belong to the genus *Dacus* and are allied to the Queensland fruit fly.

The parasites in Bangalore are only bred from species of *Dacus*, and we have no record of one on the Mediterranean fruit fly.

STOCK EATING CLIPPINGS AND CUTTINGS FROM GARDENS.

A Dangerous Practice.

Alfred J. Ewart, D.Sc., Ph. D., F.L.S., Government Botanist.

Quite a number of cases have recently been reported of deaths of stock happening after they have been allowed access to the clippings and cuttings from gardens. The danger of such a practice cannot be too strongly emphasized.

It is not generally known how large a number of our common garden plants are poisonous to stock, and since the plants are unfamiliar ones to animals grazing in the open, they have no previous experience to guide them in discriminating between harmless and poisonous plants. Nor is it safe or wise to rely too much on the experience of animals, any more than on that of children, to distinguish good from bad food. The most cautious grazing animal will eat almost anything that can be chewed and swallowed when pressed by hunger, and pregnant or milking cows seem always to be hungry.

In a recent case a correspondent writes :- "A few days ago my cattle were picking over cuttings thrown out of the flower garden. Next morning three of them were sick in the same way; quite off their feed, trembling in their hind quarters and purged. One died the following day and

another three days after, having taken no feed. There seemed to be no violent pain. They laid quietly and breathed normally. Their excrement was very thin and dark coloured. The one that recovered purged once what was like dark water."

Three specimens were sent for investigation, two of which were harmless, but the third was a shoot of the common oleander (Nerium oleander) which common garden shrub is strongly poisonous. As in the case of many poisonous plants the leaves have a bitter *warning* taste, and contain a narcotic poison as do all other parts of the plant. In some parts of the old world the peasantry have been accustomed to use the wood and bark to poison rats; while in France the powdered plant has sometimes been used for the destruction of lice, fleas and similar insects. The ancient use of the powdered leaves as a remedy for snake bite seems however to have been founded on a mere superstition. The bark of the East Indian oleander (Nerium Piscidium) when placed in water poisons the fish in the immediate neighbourhood, and is often used by the natives for fish capture.

It was only last year that many deaths of stock, and even of some children, took place from eating the highly poisonous Hemlock (*Conium maculatum*) which had been introduced in many gardens under the incorrect name of the "Carrot or Parsley Fern," and had thence been allowed to run wild. The plant has been proclaimed for the whole State and the local authorities in the districts concerned thus given the power to insist on its suppression where growing wild, or even if grown in a garden as a decorative plant. In this case the plant gives warning of its poisonous character by its objectionable mouse-like smell and unpleasant taste, which does not always however suffice to prevent its being eaten either by stock or children. In addition many poisonous plants have practically no warning taste or smell at all.

As instances of common garden plants which are poisonous to stock when eaten in any quantity the following may be mentioned: Aconite, Tobacco (Nicotiana), Lobelia, Hemp (Cannabis), Castor-oil plant (Ricinus), Yew (Taxus baccata), Hemlock (Conium maculatum), Fools Parsley (Æthusa Cynapium), Oleander, many Solanums, Belladonna (Atropa), Thorn Apple (Datura Stramonium), Poppies, Larkspurs (Delphinium), Foxgloves (Digitalis), and many others. Most Lilies, Hyacinths, Amaryllids, Crinums, Bulbine, and Narcissi, when eaten in any quantity, usually cause purging or sickness, and in extreme cases have been known to cause death. Indeed, some members of the Liliaceæ (Veratrum, etc.) and Irideæ (Cape Tulip, *Homeria collina*) contain active poisonous principles of which a small quantity acts as a fatal dose. Again many hairy, prickly or chaffy garden plants act injuriously to stock when eaten, either by irritating the tender lining membrane of the alimentary canal, or by tending to ball together in the stomach, etc., reducing the capacity of the digestive tract and ultimately blocking it.

No further illustrations of the danger of allowing stock to have access to the clippings or cuttings from a garden should be needed. Quite apart from the dangers of poisoning or of digestive derangement, we have the well known fact that a large number of garden plants when eaten in any quantity by milch cows impart a distinctive and often an unpleasant flavour to the milk or butter and in some cases make the milk unsuitable for the use of tender infants. This is due to the fact that the more volatile principles in the animal's food usually appear to a greater or less extent in its milk, and although I know of no authentic case in which the milk from a cow which had been grazing on poisonous herbage

had directly poisoned an infant, such an occurrence is by no means impossible. Cases of minor injury probably occur frequently, but are put down to other causes. Naturally, also, where the milk from a number of cows is mixed this danger is lessened, unless all have been eating the same herbage.

To sum up: unless a farmer knows the properties of every plant in his garden, and that none are injurious, it is always inadvisable, and in many cases dangerous, to allow stock to have access to the clippings, cuttings or other refuse from the garden.

VINE APOPLEXY.

The death of grafted resistant vines early after bearing caused Mr. T. Darveniza, of the Excelsior Vineyard, Mooroopna, to fear that the cause may be a contagious disease, though he failed to find any indications either on the surface or below the ground. After inspecting the affected vines, the Government Viticulturist, Mr. F. de Castella, reported as follows: "Though it is rather too late in the season for such an examination, so far as it is possible to judge, I am of opinion that Mr. Darveniza's trouble is not caused by a contagious vine disease as he feared. It is probably due to a faulty constitution of certain vines arising from want of affinity between stock and scions. The symptoms are practically identical with what is known in France as "Folletage," and in Spain as "Apoplejia," which one might translate as vine apoplexy.

This constitutional disease is fairly common in Europe. Odd vines in full vegetation and apparently good health die off suddenly about midsummer. The leaves wither, and within a few days the vine is quite dead as though killed by sunstroke. In a very hot dry summer such as that of last year, many vines die off in this way. In some of the vineyards I visited the mortality was as high as 1 or even 2 per cent. The chief cause is a want of balance between the growth of stock and scion; the upper part of the plant overtaking the sap supplied by the roots.

According to recent investigations a certain form of tinder producing fungus appears to have something to do with the disease in a good many cases. Any departure from normal conditions seems to predispose vines to this accident, but the main cause is faulty affinity.

In Mr. Darveniza's case the vines which have died are all of the Malbeck variety, and this is a somewhat difficult one to suit with a stock in Europe. In a good many cases, though the vine is quite dead above the graft, the stock has thrown vigorous suckers, and is alive and healthy, thus proving that the trouble is not caused by a contagious root disease. The fact reported by Mr. Darveniza, that the disease appeared to run in a N.E. to S.W. direction, is probably due to some predisposing feature in the soil running in this way. Mr. Darveniza is sending me some dead vines for further examination, which will be submitted to the Government Pathologist.

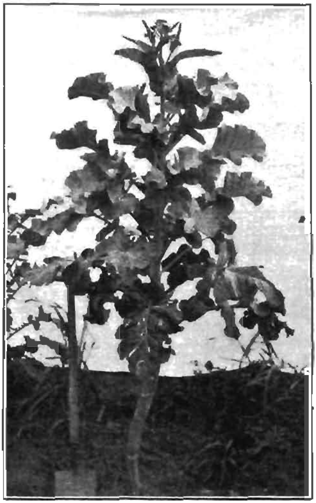
Though it will be well to keep the affected portion of the vineyard under observation next summer, I consider it most probable that the trouble is none other than the vine apoplexy so well known in the warmer parts of Southern Europe. This accident (for it is rather an accident than a disease) will no doubt become more familiar to our growers as theirgrafted vines increase in age. Its frequency is not sufficient to constitute a cause for alarm, especially if the question of affinity between stock and scion receives sufficient attention."

A NEW FODDER PLANT.

The "Chou Moellier."

J. M. B. Connor, Dairy Supervisor.

A valuable summer and winter fodder plant suitable for stock of all kinds is shown in the accompanying photograph. It belongs to the Kale family of plants, and is called "Chou Moellier." It grows 4 to 5 feet high, yielding a heavy wealth of succulent foliage; the stalks are solid, and fleshy, and have not the woody or fibrous texture of the ordinary cabbage. The leaves can be stripped off, about five times during the season, and the whole plant can be chaffed and fed to the animals with absolutely no waste.



THE "CHOU MOELLIER."

A small crop of this new fodder plant grown by me proves it to be a rapid and vigorous grower, highly nutritious and eagerly sought after by stock. It can be sown with every confidence after the first autumn rains to the end of October, and is both frost and drought resistant, as the crop under review has demonstrated. Without manure or artificial moisture of any kind since planting, it has kept growing vigorously the whole time, and has been stripped of its leaves three times. It is most important to

check evaporation and keep moisture in the soil by maintaining a "dust blanket" or soil mulch on the surface, by means of a continuous stirring of the soil while the plant is growing. The rows require to be moulded up, otherwise the plant becomes top heavy and falls down.

The seed was sown early in March, thinly, in rows 2 feet apart; where the plants showed too thickly they were transplanted. On the 4th June the plot was calculated to have produced foliage equal to the weight of 4 tons to the acre, and at the present time (31st August), when the plants are starting to seed, it would yield the same amount. The leaves should be cut off when required and not pulled; otherwise, the new sprouts will not shoot again from the old source. It is an exceedingly valuable forage plant, yielding a large amount of green feed during winter time, and on that account is especially of service to dairy farmers. I have no hesitation in recommending its culture. One pound of seed sown in prepared seed beds, will furnish enough plants for transplanting to sow about one acre.

THE PROCLAIMED PLANTS OF VICTORIA.

(*Continued from page* 544.)

Alfred J. Ewart, D. Sc., Ph. D., F.L.S., Government Botanist; and J. R. Tovey, Herbarium Assistant.

Californian Stinkweed, or Sheepweed.

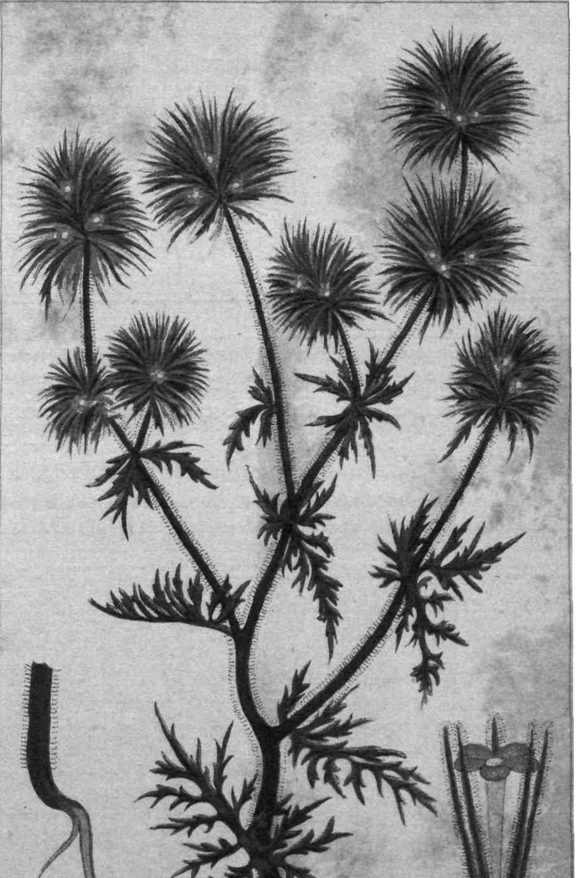
Gilia squarrosa, Hook and Arn. *Polemoniaceæ.*

It is also known as Digger's Weed and is a rather rigid plant, not exceeding one to two feet in height. The stems branch copiously in more or less zig-zag fashion and like the leaves and calyces are covered with glandular viscid hairs, emitting a fœtid smell. Leaves one to two inches long, deeply cut into pointed pinnate segments, the upper leaves and bracts simpler and spiny. Flowers in dense heads surrounded by green leaf-like bracts. Calyx of five pointed segments united at the base and exceeding the pale-blue, occasionally white, corolla lobes. Stamens and trifid stigma within the tube of the corolla.

The plant is a native of California, and other parts of North America, hence Californian Stink-weed, and was originally found on moist ground in mountain valleys. In Victoria, however, it withstands drought and spreads rapidly, being a freely seeding annual or biennial. The plant is a troublesome and aggressive but non-poisonous weed. On cultivated land it is easily kept under by clean cultivation, by the growing of root-crops, and by the destruction of seedlings by hoeing and working the soil during dry weather. On pastures and waste places, cutting before seeding will help to keep it down, and if repeated until the seed in the soil is exhausted will eventually suppress it. The seed in the soil appear to be short lived, and if the pasture is periodically rested and a good stand of grass maintained, this aids in preventing seedlings from re-establishing themselves.

Proclaimed under the Thistle Act for the whole State, March, 1907.

PLATE 29.



RECENT DEVELOPMENTS IN WHEAT BREEDING.*

F. E. Lee, Agricultural Superintendent.

It is somewhat singular that under the conditions which exist in Australia, and Victoria in particular, the contribution of Australia to the world's wheat supply is only about two per cent. of the amount annually produced. There is, perhaps, no agricultural industry in Victoria which directly engages a larger number of persons than the business of wheat growing, and yet, according to the following figures of the Government Statist, the average returns can only offer a moderate return of the capital involved.

AVERAGE WHEAT YIELD PER ACRE FOR PRINCIPAL COUNTRIES OF THE WORLD.

Country.	Yield per acre in Bushels.	Country.	Yield per acre in Bushels.
United Kingdom ...	30·85	Spain	12·98
Germany	28·24	Italy	12·75
Canada	19·47	India	11·45
France	19·22	Argentine	10·65
Hungary	17·54	Victoria (1904–8) ...	10·55
Austria	17·34	Russia	10·01
United States ...	13·07		

AVERAGE WHEAT YIELD PER ACRE IN VICTORIA FOR TEN YEARS.

1899	9·09 bushels	1904	14·49 bushels
1900	7·04 "	1905	9·26 "
1901	8·85 "	1906	11·31 "
1902	6·91 "	1907	11·13 "
1903	1·29 "	1908	6·55 "

Accepting the above official figures, which show the average wheat yield per acre for the past 10 seasons, as being accurate, we must resolutely face the fact that the production of wheat in Victoria from a large area can barely pay the expenses of sowing and harvesting. Regular yields of 5, 6 or 8 bags per acre are by no means uncommon in many districts, which goes to show that either the seasons must be held entirely responsible for the low average yields, or else the methods of cultivation in a number of cases are not up to the standard they should be.

IMPROVEMENT IN CULTIVATION METHODS.

Recognising that the difference between various systems of working land cannot be demonstrated in a season or two, the Department some four years ago instituted a series of 26 experimental fields, each of 10 acres, embracing representative wheat growing districts, from the Western Wimmera to the North-East. Upon these fields such important trials as subsoiling, rotative cropping, and the effects of continuous use of artificial manures, are being carefully noted from year to year. Three crops have been already harvested and a portion of the land is sown at the present time. While yet too early to make authoritative announcement on the subject, there are indications which point to the fact that a deeper system of cultivation on stiff clay soil permits more prompt and regular germination of seed, and at the same time, stimulates the yield

* Paper read at the Sixth Convention of the Victorian Chamber of Agriculture, held June, 1908, at Geelong.

of wheat. When it is remembered that the cost of the extra amount of labour required for subsoiling is distributed over 4 or 6 years, and that the producing power of the soil is improved thereby, it can be shown to be economical to practise subsoiling on portion of the land cropped annually. Another important point is that subsoiled land appears to be capable of producing an equivalent amount of wheat with a smaller application of artificial manure. I do not desire to make alarmist statements, but I am convinced that any serious departure from the present system of combined sheep and grain farming, now almost generally adopted, must inevitably lead to an increase in the amount of artificial manure required and a corresponding increase in the cost of wheat production. The beneficial effects of crop and stock residues on the northern soils cannot be over estimated, because it is largely upon the capacity of these soils to retain moisture that the success of wheat farming depends.

Rotative Methods of Cropping.

In addition to improved methods of handling the soil, a partial solution of the main problem may be found through the introduction of a system of rotative cropping, modified to meet the special climatic conditions of the north, and to fit in with the circumstances of the individual farmer. Sheep and wheat farming have become so closely associated in Victoria that it goes without saying that any rotation of crops in the north must be designed to serve the purpose of sheep feeding. With that object in view, crops of rape and peas both for feeding off and ploughing in as a green manure have found a place in the experimental fields. A crop of mixed oats and peas, which will be subsequently cut for hay, occupies the land at the present moment, the same land last year being under wheat. The benefit of such crops as rape and peas is threefold: besides providing feed for sheep, the soil's store of nitrogen is replenished by the latter crop, while the tap roots of both crops named are of great value in opening up the tenacious clay subsoils, and setting free plant foods previously little drawn upon. The results of these experiments will, I am sure, be watched with great interest; and when the experimental term of seven years is ended there should be an accumulation of useful facts at the service of the wheat grower.

Improvement of Seed Wheat.

Improved cultivation methods and mixed cropping have been fairly universal during the past few years, and yet the statistics show that there has been a regular decline in the yield of wheat since the good crop following the drought in 1902. It may satisfy some people to say that the seasons have been getting worse since 1903, but I cannot convince myself that such is the real cause; and, moreover, the rainfall records in northern Victoria during the past 4 or 5 years, do not bear out that contention.

The opportunity of seeing wheat farming in every district in the State has inclined me to the belief that part, at least, of the reason of the low average yield per acre can be traced to the seed itself. I may say that I am a firm believer in the grading of all wheat for seed purposes and use none other than graded seed on the Government Experimental Fields. I attribute a large portion of the success which has attended these fields to the prime sample of grain sown. There is, however, a limit even to the usefulness of graded seed, and beneficial as it may be, it is of only minor assistance if the seed itself does not belong to a prolific yielding family.

CHARACTERISTICS OF WHEAT VARIETIES.

Wheats belong to well defined families or groups, just as stock does. In horses some classes are remarkable for speed or strength, as the case may be; cattle are specialised for milk production or beef; and, I say with all the emphasis I am capable of, that the wheat grower who continues to sow a variety more suited to hay production than to grain must not expect maximum yields. I am well aware that the necessities of the wheat farmer compel him to utilise portion of his wheat crop for hay, but as I assume most wheat farmers put the crop in primarily for grain, does it not appear only logical that those varieties which have proved themselves prolific yielders should be preferred to the combined hay and grain variety? Portion of the experimental fields already referred to has each year been devoted to the trial of a number of varieties side by side, under identical conditions. From three years' trials one variety in particular has emerged triumphant as regards yield—I refer to Federation, which I may claim to have introduced to the Wimmera and Mallee by means of the experimental fields.

All the well known varieties grown by farmers were pitted against the Federation last season, with the result that almost in every instance the Federation proved superior as far as yield of grain is concerned. It is only to be expected that some districts and some types of soil will eventually show a preference for certain varieties of wheat, and, in fact, this has already been indicated in a few of the earlier districts. Besides the now familiar Federation, no less than fourteen other wheats grown upon the Government plots have shown themselves superior in yield to the ordinary seed supplied by the farmer. The experimental fields, then, can claim to have already done fine service in introducing new varieties of wheat and affording excellent opportunities for the comparison of yields, characteristics, &c. It must be confessed, however, that they can only be regarded as useful for demonstration purposes, and in no way do they afford an opportunity for scientific research.

STUD WHEAT PLOTS.

The Minister for Agriculture (Hon. G. Swinburne, M.L.A.), has recently approved of a scheme which has for its object the breeding of new wheat varieties to meet the especial conditions of soil and climate prevailing in Victoria. No longer, it is hoped, will the Victorian wheat farmer have to be dependent upon the enterprise and skill of the wheat experimentalists of South Australia and New South Wales. A committee known as the Wheat Improvement Committee, consisting of the Director of Agriculture; Mr. Pye, Principal of Dookie College; Mr. McAlpine, Government Vegetable Pathologist, and myself, has been constituted with power to initiate and carry out from year to year the practical work of breeding new wheat varieties. An area of 50 acres at Longerenong College, near Horsham, will serve the interests of the Wimmera; while 10 acre breeding stations at Dookie College, the Rutherglen and Wyuna Government farms will meet the needs of the North-Eastern, Goulburn Valley and Northern plains wheat farmers. The areas mentioned have already been sown with a number of pure strains and crossbred varieties procured from adjoining States, and abroad, as well as a large number of crossbreds created by Mr. Pye. An officer skilled in the work of crossbreeding wheat, oats, and barley—until recently in the employ of the Government of New South Wales, at the Experimental Farm at Cowra—has been appointed to carry out the necessary field work in the Wimmera,

while the valuable assistance of Mr. Pye will be sufficient to insure the success of the same work at Dookie. It is not intended that the new wheats thus created shall be handed on to the farmer until they have undergone a searching test over a large area, under ordinary field conditions at one of the Government farms. The best, and only the best, will be put on the market, and farmers securing a small portion of these new wheats, later on, will be safe in the knowledge that they have been well tried before being recommended. New wheats are not created in one season, and it may be a year or two before the new creations are sent out. I can only counsel patience to those who are desirous of securing a small amount for trial purposes.

SYSTEMATIC TESTING OF THE MILLING PROPERTIES OF VICTORIAN WHEAT.

Associated with the scheme for the improvement of the yielding properties of wheats, provision has been made for the systematic testing of the milling qualities of all varieties grown in the State. Arrangements have been entered into for the erection of a miniature flour milling plant, capable of turning out a commercial grade of flour. During the coming season bushel samples of every variety grown in the State, and from a wide range of soils, will be collected and subjected to the milling test with a view of ascertaining which are the most serviceable varieties for flour manufacture, and also to note the effect that the soil and manure have upon the milling value of the grain. As far as is known no such far-reaching scheme as outlined has ever been carried into effect in any country in the world.

The New South Wales Agricultural Department has done magnificent service through the agency of the late Mr. Wm. Farrer, and Mr. F. B. Guthrie, in making known the yielding and flour making properties of wheat; but the experiments have not, so far, embraced such wide objectives as the scheme it is intended to conduct in Victoria. It may be further added that the flour obtained from the milling test will be submitted to manufacturing bakers to be turned into bread, so that nothing will be left undone to make the investigations of the highest value to the farmer, the miller, and the baker.

The subject is, to me, of such absorbing interest, and the possibilities of bringing about an increase in the monetary return from wheat growing of such powerful importance to the State, that the delegates representing wheat growing centres have the right to know the steps which are being undertaken by the Department of Agriculture to insure a permanent improvement in the State yield of wheat. So far as enthusiasm and skill can go, the Wheat Improvement Committee will leave no stone unturned to probe the whole question to the bottom, with the hope of establishing sound facts for the future guidance of the Australian wheat farmer.

IMPROVEMENT IN DAIRY HERDS.*

P. J. Carroll, Dairy Expert.

The possibility of improving the production of the dairy herds of the State has been the subject of frequent discussion, and much writing. It is no doubt one, if not the most important, of the works remaining to be done in connection with the great dairying industry. A systematic testing and recording of the milk and butter-fat yielding capacity of the herds is the great need of the day. Records prove conclusively that there is a wide variation in the productiveness of different cows in the same herd, and that some herds show very much better average results than others. Some farmers have been enterprising enough to adopt the principle, but these are too few to have any material effect on the industry as a whole. I know of herds the results of which go to prove beyond the shadow of a doubt the value of keeping records. We have individual herds in the different districts, the average yield of which is something over 600 gallons per head, per annum, whilst the average for the whole State it but little over 300 gallons.

It is needless for me to go into details to prove that this average is altogether too low; figures speak for themselves. However, to illustrate as briefly and as clearly as possible what this difference would amount to, when applied to the whole of the cows of the State, I submit the following figures. The present average milk yield is 300 gallons per cow. The annual value of the milk and butter production according to this would be as follows:—

300 gallons milk at 3.0 fat test equals 117 lbs. fat at 10d. per lb., = £4 17s. 6d.

600 gallons milk at 3.9 fat test equals 234 lbs. fat at 10d. per lb., = £9 15s.

As there were 701,309 dairy cows in Victoria at the end of year 1906, the total value of milk produced would be £3,400,000. If 600 gallons instead of 300 were the average the value would be £6,800,000, leaving the large sum of £3,400,000 as a reward for the energy and enterprise of the dairymen. It is well known that the cost of up-keep is almost as great in the case of a cow producing 300 gallons yearly, as it is in the case of a cow producing 600 gallons of milk. The labour is the same in both cases. Assuming that it cost £2 10s. for feed and £1 10s. for labour and other expenses, per annum, or £4 in all, the average profit from the cow yielding 300 gallons per year would be but 17s. 6d., and in the case of the other cow yielding 600 gallons per year, some £5 15s.

It is on record that the average in Denmark is something like 700 gallons per year. In the year 1903, 628 herds yielded an average of 770 gallons of milk; other herds yielded as high as 1,100 gallons.

To show that this statement is not an exaggerated calculation I will quote the experience of Denmark.

"When these Associations were started Denmark exported to Britain £3,800,000 worth of butter, and in 8 years the value had increased to £5,800,000 from about the same number of cows. The cost of making the tests was from 1s. 8d. to 2s. 6d. per cow. The Government of

* Paper read at the Sixth Convention of the Victorian Chamber of Agriculture, held June, 1908, at Geelong.

Denmark provided the sum of £6,400 per year for 10 years, and the expenditure of this £64,000 was the means of increasing the annual return by £2,000,000."

The following table contains the first, (1898-1899) and latest (1902-1903) years' results of a five years' record of ten associations, all milking cows and heifers included :—

	1898-99.				1902-03.				Increase in yield per Cow.		
Assoc. No.	Cows in 365 days.	lbs. Milk.	Per cent. fat.	lbs. Butter.	Cows in 365 days.	lbs. Milk.	Per cent. fat.	lbs. Butter.	lbs. Milk.	Per cent. fat.	lbs. Butter.
A	249·7	7,151	3·37	268	303·3	7,827	3·44	299	656	0·07	31
B	244·6	7,011	3·41	265	306·8	8,078	3·45	309	1,067	0·04	44
C	333·2	6,995	3·35	260	286·2	7,730	3·45	296	735	0·01	36
D	382·6	6,888	3·37	257	314·4	8,043	3·43	307	1,155	0·06	50
E	310·3	6,874	3·40	259	323·1	8,185	3·44	314	1,311	0·04	55
F	99·1	6,639	3·25	240	319·5	8,056	3·38	303	1,417	0·13	63
G	238·3	6,449	3·33	239	183·0	7,955	3·33	294	1,506	..	55
H	499·1	6,387	3·49	249	418·8	6,371	3·35	236	16	0·14	13
I	318·5	6,374	3·49	248	255·8	7,768	3·37	390	1,394	0·12	42
J	432·0	6,355	3·24	228	417·8	7,440	3·35	276	1,085	0·11	48

When the centrifugal separator was introduced into this State and the factory system adopted the Government of the day granted a large sum of money to assist the dairymen in building up an export trade. This was the means of so rapidly expanding the industry. The factory system was copied from the Danes, and Victorians have been indebted to them since for much of the improvement that has taken place in the various branches of the industry. Those engaged in the manufacturing branches, have almost, as far as circumstances permitted, kept pace in the matter of quality, cost of manufacture, and management, with their competitors in Denmark and other butter manufacturing countries. Those who devote their time and calling to the production of the raw material have—with a few bright exceptions, of which some will serve as illustrations—almost remained stationary in perhaps the most vital part of their work, that is, the improvement of their dairy herds. Since the inception of the factory system little improvement has taken place in the dairy herds. Certainly what has taken place is not at all in keeping with the great strides made in nearly every other branch. The dairy farmer is slow to make any effort to improve his herd by a system of record, and it is only by such that any substantial improvement will be brought about. He thinks it is too costly and takes up too much time to be bothered with; but if he will only try he will soon find the time is well spent and the cost fully repaid. The following figures will illustrate how stationary the average production of the dairy cows of this State has been since 1901 :—

Year		Cows.		Average Yield.
1901	...	483,650	...	322 gallons
1902	...	510,546	...	274 "
1903	...	515,179	...	336 "
1904	..	632,493	...	329 "
1905	...	649,100	...	328 "
1906	...	701,309	...	330 "

According to the above figures the improvement in the average yield since 1901 is so slight as to be not worth recording.

The following figures relating to eleven Jersey stud cows, the property of Mr. G. T. Chirnside, Werribee, are worth quoting to show what can be obtained by systematic recording, combined with care and attention :—

Name of Cow.	Days in Milk.	Butter. lbs.
Maderia ...	... 355 ...	610
Golden Drop ...	... 398 ...	568
Favorite No. 2	... 317	515 – 2 ozs.
Cherry Blossom	... 365 .	479 – 1 "
Grace ...	... 384	420
Frivolous ...	... 365 ...	410 – 10 "
Yellow Aster ..	... 332 ...	368 – 5 "
Audrey ...	... 331 ...	351 – 11 "
Briar ...	... 334 ...	323 – 9 "
Oak Leaf ...	... 334 ...	323 – 9 "
Snowdrop ...	... 334 ...	313 – 2 "

Average 420lbs. 1oz. butter, as compared with the average of the State of about 126 lbs.

This shows what can be done by a thorough system of breeding, selection, keeping of records, and tests, etc. In the *Journal of Agriculture* of June 1907, there appeared an excellent article on the development of dairy Shorthorns by Mr. R. T. Archer which should be in the hands of every dairyman who is alive to his interests. It clearly points out the splendid results due to systematic effort and is a striking illustration of the value of recording each cow's weight of milk and test of same. No further proof of the value and efficacy of this system should be required. The article shows how Mr. Manifold developed a dairy herd out of his station-bred Shorthorns. The system adopted was to weigh the milk of each cow one day in every month, and to take a composite sample of the milk of each day for a whole week in each month—this is surely not much trouble. The cows not giving a satisfactory return were fattened, and all the low testing ones culled. The lowest annual average test was 3.7 and the highest 6.2 ; very few tested below 4 per cent. and one (Number 123) for four successive years averaged 5.2, 5.5, 6.2, and 5.0 per cent. fat. This cow's return for the four periods of lactation was 330 days in milk, 395 lbs. of butter ; 240 days in milk, 339 lbs. of butter ; 270 days in milk, 353 lbs. of butter ; 210 days in milk, 259 lbs. of butter.

Some of the cows milked over 500 days without a break and averaged nearly a pound of butter per day for the whole time. One (No. 473) in six periods of lactation milked on 1850 days and gave 5.335 gallons of milk, and 2,390 lbs. butter, which, at 10d. equalled £99 11s. 8d., or over £16 per year ; her daily averages were, milk, 2.88 gallons ; test, 4.08 lbs. ; butter, 1.29. These cows were never pampered in any way.

In 1905-6, 13 heifers on first calf, were milked altogether on 3,820 days, and totalled 3,769 lbs. butter, or a fraction under a pound per day. One gave 403 lbs. of butter in 365 days. In 1905 the averages of the thirteen heifers were as follow :—

In Milk—Average Days.	Milk Average. Gallons.	Test Average.	Butter.	Return at 10d. per lb.
293 ...	583 ...	4.53 ...	289.9 ...	12 1 7

The following is a record of thirteen three-year-old, pedigree shorthorns (heifers) for the year 1905-6 :—

Herd No.		Days in Milk.		Gallons		Test		Butter.		Return at 1od. per lb.
1367	...	300	...	570	...	4·1	...	251	...	£10 15 0
1700	...	300	...	750	...	4·2	..	350	...	14 11 8
1766	...	365	...	840	..	4·3	...	403	...	16 15 0
1804	...	365	...	683	...	4·4	..	320	...	13 6 8
1851	...	270	...	297	.	5·4	..	173	...	£7 4 2
1854	...	270	...	540	...	4·4	...	265	...	11 0 10
1556	...	300	...	660	...	4·2	...	308	...	12 16 8
1278	..	330	...	617	..	4·[illegible]	...	325	...	13 10 10
1181	..	300	...	630	...	4·5	..	317	...	13 4 2
1286	...	300	...	450	...	5·3	...	265	...	11 0 10
1373	..	210	...	400	...	4·7	...	211	...	8 15 10
1689		240	...	640	...	4·5	...	326	...	13 11 8
1651	...	270	.	540	...	4·4	...	255	...	10 12 6
	Average		..	583	.		...	289·9	...	12 1 11

As far back as 1906, Mr. Crowe, Superintendent of Exports, issued a pamphlet on the "Utility of Testing Cows," which may be had on application to the Department.

Other Victorian instances could be quoted of the value of records but I will now refer to a few from New Zealand and Denmark. The following, taken from the New Zealand Annual Report of the Department of Agriculture 1907, are results of tests carried out at the Weraroa Experiment Farm :—

"The result last year of weighing each cow's milk morning and evening with monthly butter-fat tests disclosed the fact that many of the herd were worthless as dairy cows. A great number of them as they dried off were fattened and sold to the butcher, and the season was started with a reduced number of cows. Notwithstanding this, the monthly returns of milk are far ahead of last season. The difference of a few of the returns of this season compared with last are as under :—"

Month.			Cows Milked. 1905.		1906.		Cows fewer in 1906.		Increased Milk Yield in 1906.
August	...	...	62	...	42	...	20	...	6,412 lbs.
September	...	...	72	..	43	...	29	...	1,536 "
October	...	...	82	.	67	..	15	..	5,372 "
November	...	...	104	...	81	...	23	...	13,543 "

"The impression that the system of weighing and recording each cow's milk involves much trouble is erroneous. The beginning is the hardest part of it. If dairymen would only give it a trial they would find the trouble and delay not nearly so much as they had thought, and the work would become very interesting, besides the profitable information being gained definitely as to which cows are worth keeping and breeding from."

"The following table shows the comparative results from 6 good and 6 inferior cows :—

SIX GOOD COWS.

No.	Breed	Days Milked.	Average Daily.	Milk Yield.	Test.	Butter Fat at 10½d. per lb.	Butter Fat Value.			Skim Milk, value at 2d. per gallon.			Total Value		
			lbs.	lbs.		lbs.	£	s.	d.	£	s.	d.	£	s.	d.
1	Holstein	299	40·7	12,167	3·7	450·1	10	18	10	2	3	1	21	16	11
2	"	322	33·7	10,874	3·7	402·3	17	12	0	1	18	6	19	10	6
3	Shorthorn	322	33·4	10,775	3·6	387·9	16	19	5	1	18	1	18	17	6
4	"	278	34·1	9,477	3·7	350·6	15	6	9	1	13	7	17	0	4
5	"	280	32·9	9,211	3·8	350·0	15	6	3	1	12	7	16	18	10
6	"	274	31·5	8,643	4·0	345·7	15	2	5	1	10	7	16	13	0
							100	0	8	10	16	5	110	17	1

SIX INFERIOR COWS.

No.	Breed.	Days Milked.	Average Daily.	Milk Yield.	Test.	Butter Fat at 10½d. per lb.	Butter Fat Value.	Skim Milk, value at 2d. per gallon.	Total Value.
			lbs.	lbs.		lbs.	£ s. d.	£ s. d.	£ s. d.
1	Shorthorn	155	25·6	3,977	3·0	119·3	5 4 5	0 14 1	5 18 6
2	"	154	25·2	3,888	3·0	116·6	5 4 5	0 13 9	5 15 9
3	"	136	28·3	3,855	2·9	111·7	4 17 9	0 13 7	5 11 4
4	"	155	24·6	3,821	2·8	106·9	4 13 6	0 13 6	5 7 0
5	"	110	25·5	2,811	3·2	89·9	3 18 8	0 9 11	4 8 7
6	"	80	21·0	1,685	2·8	47·1	2 1 2	0 6 0	2 7 2
							35 17 6	3 10 10	20 8 4

"In order to show the profit and loss between the good and bad cows, the following table may be interesting:—Allow £2 10s. per cow for food and £1 10s. per cow for labour, &c. £4 in all. The surplus over that amount can be regarded as profit.

	£ s. d.
The best cow gave a clear profit of	17 16 11
The 6 best cows gave (an average of £14 7s. 6d. per cow) ...	86 17 1
The 6 inferior cows gave (an average of 18s. per cow) ...	5 8 4
The worst cow shows a loss of	1 12 10
20 cows equal to 6 best would give a net profit for year of	289 10 0
20 cows equal to 6 inferior would give a net profit for year of	18 1 1"

Results in Denmark—In the year 1895 members of the local cattle breeders association, Vejen, Denmark, formed themselves into an organization for the purpose of ascertaining and possibly increasing the productiveness of their dairy herds of some 300 milch cows. This position was forced upon them by the high prices ruling for food stuffs and the unsatisfactory margin for profit and labour expended. The work would be costly and in some cases impracticable for the farmer to carry on single-handed, but on a co-operative plan it would be comparatively slight and within the reach of all. A set of by-laws was adopted, and the association was named Vejen and vicinity Record Testing Association. The movement, as might be expected, was watched with a great deal of interest, and a number of new associations were formed each year as the following table bears out:—

Year.	Associations.	Members.	Cows.
1895	2	47	835
1898	109	1,844	45,005
1902	327	7,134	130,929
1903	367	7,990	142,296
1904	402	8,991	155,287

Somewhat similarly constituted associations were brought into existence in Sweden, Norway, and Germany. In Canada the work is organized and carried out subject to the Department of Agriculture, whose officers test all milk for the Association.

Are dairymen going to be content with such comparatively poor results when so much improvement might be made with a little intelligent effort? *Any scheme having for its object the improvement of our dairy stock* must have the sympathy and support of the dairy farmers themselves; and, in addition, must involve as little trouble and expense as possible.

The usual practice in other countries where testing associations are now in full operation is to use some Central Association similar to the Royal Agricultural Society for the purpose of organising the work. I fear, however, that this must of necessity entail a lot of detail that would

be beyond the scope of that body. I therefore propose to submit that the work of organizing be done by the Agricultural Department in conjunction with the boards of directors of the Butter Factories in the various districts. The work should be confined to a limited area for a commencement, and for that purpose some of the more closely settled districts should be selected. A meeting of the dairymen should be called at the instance of the board of directors, and the officer to whom the work of organising may be entrusted should lay the scheme before them, and at the same time, enrol the names of dairymen who were prepared to submit their herds for testing and undertake to render the assistance necessary for the proper carrying out of the work.

Having had considerable practical experience in the weighing, sampling and testing of milk at various agricultural shows in the State, I am fully convinced that any system of testing for butter-fat that does not provide for the testing of individual milkings, or if composite samples are required, the taking of a proportionate part of each milking, will not be accurate. The general experience in Victoria has been, owing to the greater length of time elapsing between the night and morning milking that the quantity of milk given in the morning is very much greater and the test lower than the night's milk.

I desire to point out, before proceeding to outline any scheme to get absolutely accurate and reliable results, that a daily weighing and testing of the milk is essential. As the adoption of this method would apparently involve a great deal of labour and some expense, it is proposed to submit a simpler system sufficiently accurate to enable dairymen to locate the unprofitable cows for rejection from the herd. The weighing of the milk and the mere fact of taking a small quantity for testing is simple in itself, but the difficulty in providing for variation in quantity and quality in the night and morning's milk is one which will have to be overcome.

In the proposed scheme, the following conditions would have to be complied with :—

1. Any person who will agree to keep a record of individual cows during the whole milking period to the extent of weighing the morning and evening's milk on at least three days every month; and also to take the samples for testing, will be admitted to membership. The number of members may be limited at the discretion of the board of directors.
2. The milk will have to be preserved, and a composite sample sent in once a month for testing as directed.
3. Members will be expected to provide themselves with scales, weighing can, sampler, record chart, and sample bottles for each cow, and a box for holding samples.
4. Members shall assume the responsibility of delivering the samples to the place where sampling is to be done, on such days as may be directed by the person in charge of that work.
5. The local butter factory will undertake to place testing apparatus and facilities at the disposal of the officer appointed by the Department of Agriculture.

According to the conditions specified the dairyman is involved in a trifling outlay only; the work and expense being divided between the butter factories, which supplies power and material for carrying out tests, and the Department of Agriculture, which supplies the organiser and tester.

The duties of an officer appointed by the Department shall be as follows:—

1. To approach boards of directors, and consult with them prior to the formation of the association.
2. To attend meetings of dairymen and address them on the question of improvement of dairy herds, explain the methods to be adopted, and assist in the formation of the association and its conduct.
3. To visit all members of the association and instruct them in methods of weighing and taking samples.
4. To make official tests when required, for the purpose of admission into the milk register to be referred to hereafter.
5. To check results of test of dairymen who are members of the association, and compare same with factory returns.
6. At the end of each year to prepare a report and statement showing result of year's work; also a quarterly statement for publication.
7. To perform all testing for the association at the place appointed for the purpose.

The instructions to dairymen in the methods of weighing and taking samples are:—

1. One of the blank record forms should be posted in the shed on a board with a pencil attached—in a convenient and well lighted place—and the balance should be fixed close by.
2. It is recommended that each cow's milk be weighed every night and morning, and that a sample for testing be taken three times a month that is, on the 10th, 20th, and 30th of both the night and morning's milk, and transferred to the bottle.
3. If it be found impracticable to weigh each cow's milk night and morning then it will be necessary to weigh only on the days set apart for sampling. The sum of the three days' milk divided by 3 multiplied by the number of days in the month will represent the total yield per cow per month.
4. Immediately after weighing each cow's milk the sample in the sampling tube is transferred to composite sample bottle by placing the top of the forefinger of the right hand on the top of the tube, thereby preventing the admission of air, and consequently the outlet of milk sample from same.
5. It is important that the whole of the milk contained in the tube be put into a composite sample bottle and care must be exercised in placing each cow's milk in the right bottle.
6. Immediately the milk is transferred to composite sample bottle the cork must be inserted tightly to prevent evaporation.
7. Mix the milk in the test bottles every time a fresh sample is added by giving the bottle a rotary motion.
8. Each cow's name or number should be affixed to composite sample bottle.
9. Keep the box containing the test samples undisturbed in a cool place and always safely locked.
10. Forward record sheets enclosed in sample box when delivering same to factory.

A Milk Register.

For some permanent good to result from the recording of each cow's milk, and to insure that the progeny of the best cows only may be retained for dairying purposes a milk register should be taken in hand. It need not be kept exclusively for pure breeds of cattle but should be open to all classes that have proved themselves profitable dairy cows. A special heading will be provided for the different pure breeds. Those of mixed breeding, or what are termed cross-bred, will be entered under a separate heading.

Conditions of Entry to Milk Register.

1. Any cow to become eligible for registration must previously have proved by test as heretofore provided capable of yielding a standard of 300 lbs. of butter-fat for the milking season of not more than twelve successive months.
2. Every application for registration should be accompanied by a statutory declaration to the effect that the conditions and instructions set out in the regulations for membership of the cow testing association have been complied with.
3. A true description of the animal, age, colour, brand, and if pure bred, the name of sire and dam, if cross-bred, the breeds of sire and dam; must be supplied.
4. A bull to be eligible for registration must be the progeny of a standard test cow, and his sire must be pure bred, and the progeny of a standard test cow also. Bulls may be admitted if the applicant can satisfy the officer in charge that the dam is up to the standard prescribed. Weekly or monthly tests may be accepted for this purpose and a standard for same as follows:—7 days record, 2 years old and under 3 years, 5 lbs. butter-fat; 3 years and under 4 years, 6 lbs. butter-fat; 4 years and over $7\frac{1}{2}$ lbs. butter-fat, per week.

   If the officer is satisfied after one or more such tests, he may recommend the granting of a certificate.

   Such cow or cows must of necessity be the property of a member of the association and subject to the conditions of same. Should the annual yield fall below the standard set out for admission the certificate already granted to the cow and progeny (if any) may be cancelled.

   The cost of special tests above referred to, must be borne by the applicant.
5. The board of directors and the officers to whom the work of keeping the register has been entrusted, shall reserve to themselves the right of investigating the record and breed of each cow and bull entered for registration, and conduct further official tests, if necessary, before final registration is granted.
6. A fee of 10s. will be charged for all certificates issued, to cover cost of bookkeeping and printing.

DAIRY FARMING.

PRACTICAL POINTS FOR PRODUCERS.

P. J. Carroll, Dairy Expert.

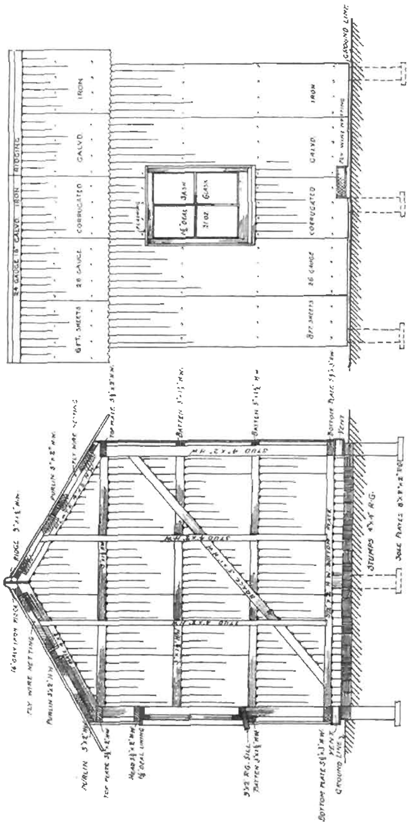
Plan and Specification of a Separator Room for a Small Dairy.

It is not advisable to have separator room and dairy all in one, as it is important that the dairy should be distinct altogether from the separator room; this being so the plan given is for a dairy for the storage of cream or milk only.

A separator room is most convenient when placed close to the cowshed, but detached from same, with due regard to prevailing winds and drainage, &c. The separating room, no matter how well it may be kept, is not a suitable place for the storage of cream, as such should be removed immediately after separating is completed. The class of separating room will depend entirely on the kind of cowshed buildings and conveniences. The dairy should, as stated before, be a separate building erected in a convenient place, not too close to the cowshed or other building, with perfect drainage, light, and cleanly surroundings, due regard being also had to the prevailing winds. The building may be constructed of wood or galvanized iron—if of the latter, I would recommend that the iron be nailed on the *inside* of the studs, not the outside as in drawing, thus providing a smooth impervious surface easily cleansed. The eaves should project well over the wall with an open space to provide free circulation of air under the roofing. These openings would require to be closed in with wire netting of a small mesh to prevent birds from getting in. Windows, with hinges for opening, should be placed in a convenient position to give sufficient light and ventilation: window and door openings should be covered with wire mesh shutters. Shaft ventilator should be placed on the roof and ventilators on the three walls on a level with the floor. The bottom board may be placed on hinges in order to flush out floor with fresh air when necessary and dry same after washing down. The floor should be of brick and cement or concrete, well laid down on a solid foundation, with fall to one end to a gutter to carry off drainage and water used in flushing.

Quantities and Specification.

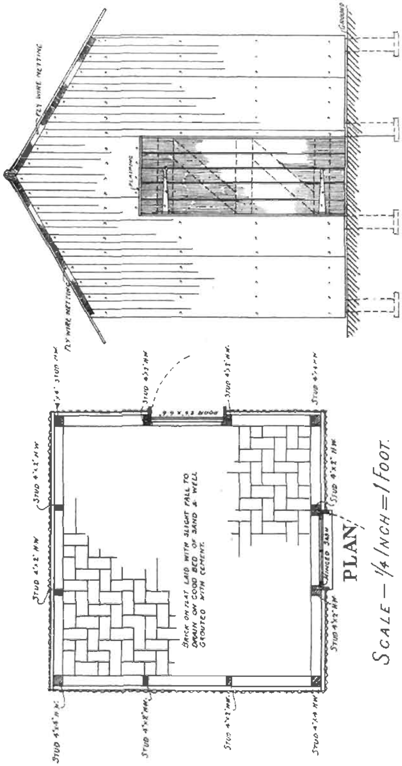
Red Gum—				
Sole Plates ..	8in.	× 3in.	9—8in.	Sunk 1ft. 6in. into ground.
Stumps ..	4in.	× 4in.	9—2ft.	Set perfectly upright on sole plates and earth well rammed round stumps.
Kerb	6in.	× 1½in.	1—2ft. 9in.	To doorway, stumps checked for kerb.
Window sill ...	9in.	× 2in.	1—2ft. 8in.	
Vents	7in.	× ¾in.	1—6ft.	To form boxed openings at floor level.
Hardwood—				
Top and bottom plates ..	5½in.	× 2in.	6—9ft.	Halved at joints and mortised for corner studs and checked for other studs.
Corner studs ...	4in.	× 4in.	4—7ft. 6in.	Tenoned into top and bottom plates.
Studs	4in.	× 2in.	4—7ft. 6in.	Checked 1in. for braces, and ½in. for window head and sill.
Studs	4in.	× 2in.	4—9ft. 3in.	Checked 1in. for braces, and ½in. for top plates and door head.



SECTION

ELEVATION

SEPARATOR ROOM FOR A SMALL DAIRY.



SEPARATOR ROOM FOR A SMALL DAIRY.

Hardwood (continued)—

Top plates to gable ends ...	4in. × 2in.	4—5ft.	
Door and window heads ...	5½in. × 2in.	2—2ft. 9in.	
Battens for iron	3in. × 1½in.	7—9ft. / 6—3ft. 3in.	Skew nailed on to inside of studs.
Braces... ..	3in. × 1in.	2—10ft. 6in. 2—8ft.	
Ridge	9in. × 1½in.	1—10ft.	
Purlins ...	3in. × 2in.	6—10ft.	
Deal—			
Door sheeting ...	6in. × ⅝in.	5—6ft. 6in.	
„ ledges ...	6in. × ⅞in.	3—2ft. 6in.	
„ braces ...	6in. × ⅞in.	2—3ft. 3in.	1—2ft. 8in.
„ jamb lining	7in. × 1¼in.	2—6ft. 6in.	1—2ft. 8in.
„ stop ...	3in. × ⅝in.	2—6ft. 6in.	1—2ft. 8in.
Window ...	1½in. × 2ft. 6in.	× 3ft. 3in.	deal sash, 4 lights glazed with 21oz. glass hung on one pair of 3in. steel butts, and with 6in. barrel bolt and cabin hook.
„ jamb lining	7in. × 1¼in.	2—3ft. 6in.	1—2ft. 8in.
„ stop ...	3in. × ¾in.	2—3ft. 6in.	1—2ft. 8in.

Corrugated galvanized iron 26 gauge, 2—5ft., 10—6ft., 8—8ft., 5—10ft. 4—9ft.
Ridging, 14in., 24 gauge galvanized iron, 2—6ft.
Nails, 5 packets spring heads, 1 lb. 4in., 1 lb. 3in.
Fly wire netting, 1 square yard. Lead flashing, 8ft. × 6in.
Bricks, 300. Sand, 1 cubic yard. Cement, 1 cwt.

At Melbourne prices, the total cost would be about £11—material £8, labour £3.

To Keep Cream Free from Dust, and in Good Condition.

The cream should be cooled immediately after separating, either by means of passing over a small cooler—several of which are on the market at the present time—or by placing the vessel containing the cream into a tub or other receptacle containing cold water. The cream can should be covered carefully with two to three thicknesses of butter cloth; this permits of the escape of animal gases, and prevents flies and dust from getting into the cream. In very hot weather it is advisable to fix a sack round the cream can and keep it moistened with water. The cream of course must be stirred at least twice a day with a clean stirrer. It will be found advantageous to remove the cream from the dairy and place it outside on a convenient stand during the night, when the outside atmosphere is cooler; care must be taken to keep it well covered from dust and other sources of contamination. If these precautions are taken and the cream delivered at frequent intervals to the factory, there should be little difficulty regarding quality and condition.

The First Cream from the Separator.

The first of the cream that comes through the separator should be caught in a separate vessel and returned to the milk vat so as to have cream of a uniform fat percentage.

Clotted Milk in Cream.

This is the result of separating cream too thinly, thereby including a too large proportion of skim milk. Sometimes it may result from failure to stir the cream at regular intervals, as when it is allowed to stand undisturbed, the milk, being the heavier portion of the bulk, will naturally

sink to the bottom. It is recommended that the cream should be separated so as to contain at least 40 per cent. fat.

TEMPERATURE TO SEPARATE AT.

A temperature of 86 degrees F. is sufficient to enable perfect separation of fat from the milk to take place, provided, of course, that due regard is paid to rate of speed and feed of separator. If it is necessary to heat the milk, it is better to do so by immersing the vessel containing it in hot water.

COMPUTING BUTTER-FAT RESULTS.

The following is the method adopted:—Multiply the pounds of milk by the percentage of fat, and divide the result by 100. The answer will be *the pounds of fat contained in that quantity of milk. Example, 100* lbs. of milk multiplied by 4 per cent. of fat = 400 lbs.; divided by 100 = 4 lbs. of fat. The following is the result of the figures submitted by J.E.B.:—

No 1 cow,	190	lbs. of milk,	test 4	per cent.	= 7·6	lbs.	butter fat	per week.
No 2 cow,	215	,,	,, 3·5	,,	= 7·52	,,	,,	,,
No. 3 cow,	107½	,,	,, 3·4	,,	= 3·76	,,	,,	,,
No. 4 cow,	108½	,,	,, 4·6	,,	= 4·99	,,	,,	,,

Example—190 × 4·0 = 760·0 which, divided by 100, gives 7·6.

CLEAN SKIMMING.

There should not be more than 0.1 per cent. of fat left in skim milk; the result obtained by correspondent, 0.07, is reasonably good skimming. 100 gallons of milk = 1,000 lbs. approximately. With this loss of .07 per cent. of fat the result would be as follows:—1,000 lbs. of whole milk would produce 900 lbs. of skim milk; the latter multiplied by .07 and divided by 100 would show that .63 lbs. of butter fat were lost in 1,000 lbs. of milk.

SEPARATE EACH TIME INTO FRESH VESSEL.

Should a separate vessel be used each time when separating, if a cooler is used, or can several milkings be run into the one can, is asked.

It is advisable at all times to separate into an empty vessel. The cream when cooled, may be added to the bulk cream, which should be thoroughly stirred up. It is important that before mixing, the cream in the two vessels should be as near the same temperature as possible.

Artificial Manures Acts.

SUPPLEMENTARY LIST OF UNIT VALUES OF MANURES IN THE MELBOURNE MARKET DURING THE 1908 SEASON.

Description of Manure.	Moisture.	Nitrogen.		Phosphoric Acid.		Estimated Total Value of the Manure per ton.	Price Asked for Manure per ton Delivered at the Local Railway Station.	Where Obtainable.
	Percentage.	Percentage.	Estimated Value in One ton of the Manure.	Percentage.	Estimated Value in One ton of the Manure.			
Mainly Nitrogenous.			£ s. d.		£ s. d.	£ s. d.	£ s. d.	
Blood Manure	10.08	6.47	3 17 8	1.40	0 4 11	4 2 7	4 10 0	George Gardiner, Marshalltown, Geelong

Description of Manure.	Moisture.	Phosphoric Acid.								Estimated Total Value of the Manure per ton.	Price Asked for Manure per ton Delivered at the Local Railway Station.	Where Obtainable.
		Water Soluble.		Citrate Soluble.		Insoluble.		Total.				
	Percentage.	Percentage.	Estimated Value in One ton of the Manure.	Percentage.	Estimated Value in One ton of the Manure.	Percentage.	Estimated Value in One ton of the Manure.	Percentage.	Estimated Value in One ton of the Manure.			
Mainly Phosphoric, Phosphoric Acid readily Soluble.			£ s. d.		£ s. d.		£ s. d.		£ s. d.	£ s. d.	£ s. d.	
Hasell's A1. Superphosphate ..	12.09	19.10	4 10 9	1.48	0 5 11	..	..	20.58	4 16 8	4 16 8	4 7 6	A. H. Hasell, Melbourne

Supplementary List of Unit Values of Manures in the Melbourne Market during the 1908 Season—*continued.*

Description of Manure.	Moisture.	Nitrogen.		Phosphoric Acid.		Mechanical Condition.						Estimated Total Value of Manure per ton.	Price Asked for Manure per ton Delivered at Local Railway Station.	Where Obtainable.
								Nitrogen.		Phosphoric Acid.				
	Per-cent-age.	Per-cent-age.	Estimated Value in One ton of the Manure.	Per-cent-age.	Estimated Value in One ton of the Manure.	Per-cent-age of Fine Bone.	Per-cent-age of Coarse Bone.	Per-cent-age in Fine Bone.	Per-cent-age in Coarse Bone.	Per-cent-age in Fine Bone.	Per-cent-age in Coarse Bone.			
Containing Phosphoric Acid and Nitrogen—Phosphoric Acid Difficultly Soluble.			£ s. d.		£ s. d.							£ s. d.	£ s. d.	
Bonedust, No. 1	6.25	3.62	1 16 10	13.94	2 10 8	27.00	73.00	0.98	2.64	3.77	10.17	4 7 6	5 0 0	J. Holdsworth, Beaufort
Bonedust, No. 2	5.91	3.38	1 15 2	19.61	3 12 1	35.25	64.75	1.20	2.18	6.88	12.73	5 7 3	5 10 0	" " "
Bonedust	8.94	4.01	2 1 1	22.32	4 1 6	30.20	69.80	1.21	2.80	6.70	15.62	6 2 7	5 10 0	Geo. "Benson," Warrnambool
Bonedust	8.00	3.77	1 17 3	21.64	3 17 4	15.00	85.00	0.57	3.20	3.25	18.39	5 14 7	5 15 0	S. R. Mansell, Mildura

P. RANKIN SCOTT,
Acting Chemist for Agriculture.

Government Laboratory,
Melbourne, 25th August, 1908.

THE GROWING OF FODDER CROPS.

Demonstration Work on Dairy Farms.

G. H. F. Baker, Dairy Supervisor.

The vicissitudes encountered by the bulk of dairy farmers lately have forcibly emphasized the frequent admonitions by the officers of the Department of Agriculture that profitable dairying cannot, on account of the variation in quantity and the uncertain distribution of the rainfall, be carried on throughout the year by a sole dependence upon grazing. The minority who last season made ample provision to meet the contingencies that arose, and secured a substantial profit as the result of their forethought, which is synonymous with good husbandry, realize how sound was the advice given. Many of the majority will follow the newer and rational methods as they come to realize that the bulk of the 15 to 18 tons of green fodder necessary in a year to a cow for the profitable production of milk can most economically be supplied by hand feeding. As 10 tons of green fodder per acre is a good average return to be obtained in one crop it follows that an area of land commensurate with the quantity of fodder required to supplement the feeding of a herd must be cultivated, or from a smaller area two fair crops must be obtained annually, which may be accomplished, as a rule, by systematic rotation.

That the closer association between farmers and officers of the Dairy Supervision Branch is showing valuable results by reason of practical demonstrations in the improvement of cultural methods made possible, is evidenced in this article.

In order to permit of a practical demonstration being made in the cultivation of fodder crops two of the largest and longest established dairymen supplying milk to the metropolitan area—Mr. T. Baker who milks an average of 400 cows daily on his farm at Somerton, and Mr. W. Baker, whose herd, milked at his Woodstock farm, averages 300 head—some time ago arranged to have certain land on their farms sown and cultivated according to the methods advocated by the Department, slight variations in different sections being made.

On Mr. W. Baker's farm an area of 5 acres was set aside for experimental plots of several varieties of grain; and Mr. T. Baker sowed his season's crop of 30 acres of maize in drills of various widths, and kept very complete tally of the results obtained from them. This was a particularly suitable experiment for such a dry season, because what sowing of maize is done in the district is generally on the broadcast system; and, as the area selected adjoined the road from Melbourne to Kilmore the whole course of the demonstration was in full view of all who passed.

On Mr. W. Baker's farm at Woodstock the whole of his first 29 acres of maize was sown in drills, but the cultivation was varied from that at Somerton and in a second and later sowing of 20 acres, a 4-acre section of the best land was reserved for broadcast sowing under the old method. The several results were very interesting to the many who had the opportunity of noting them.

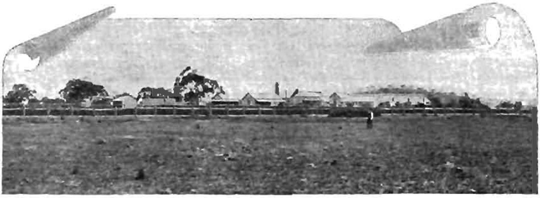
Mr. W. Baker's Experimental Plots of Maize, Peas and Beans.

The original intention of getting the yields from each of the experimental grain plots weighed separately was frustrated during harvesting

as by a mischance the various yields were hopelessly mixed. The results therefore could only be approximated. The experiments gave every prospect of being highly satisfactory.

The site selected was part of 20 acres that had been broken up the previous winter, reploughed twice, given a dressing of farmyard manure of six loads per acre, and then sown with maize. When the maize was off, the land was ploughed, and on the 3rd and 4th of June, sown with peas and beans at the rate of two bushels to the acre and manured at the same time with 1 cwt. of superphosphate to the acre. The several varieties of oats were sown on the 4th and 5th of June at the rate of one bushel to the acre and 1 cwt. of superphosphate.

Two lots of peas—½ acre of Yorkshire Hero and ½ acre of Partridge field peas—were sown. The Yorkshire Hero pea did not do at all well, was fully a week later in coming through than the Partridge variety, and did not grow or pod satisfactorily; the Partridge variety came up strongly, grew slowly but well, making a strong growth, bloomed and podded well. Both of these plots were drilled in at the usual 7 inch space, which, of course did not allow for cultivation.



GENERAL VIEW OF MR. W. BAKER'S HOMESTEAD.

There were two varieties of beans planted—the Wonder broad bean, and the Tick bean. They were hand sown in rows about 3 feet apart. The broad bean came up slowly, stooled very little, made very poor growth, bloomed shyly, and on the whole was disappointing; on the other hand, the Tick variety was an all round success. It came up well, stooled well, grew strongly, averaging 2 ft. 6 in. high, and podded heavily. The crop came into bloom when about 12 inches high, and kept on growing and blooming until maturity was reached.

Five varieties of oats were sown, viz.:—Stout White, Black, Dun, Tartarian, and Algerian. The Stout White stooled well, reaching a height of 3 feet, and gave promise of fully 12 bags of grain to the acre. The Tartarian oats stooled and promised, if anything, better than the Stout White; it was a beautiful crop, 3 ft. 6 in. high, and as level as a table. The district farmers maintain that this variety will not grow satisfactorily here, but, in this instance it gave full promise of equalling the yield of the Stout White. Adjoining the Tartarian was the Black variety. This came up well; but, stooling excessively, did not head well, giving neither height of stalk nor weight of grain. It was practically a failure. On the other side of the Tartarian plot the Algerian was planted. It shot well, but did not equal either the Stout White or Tartarian in stooling. It attained a height of 2 ft. 6 in., headed well, and was estimated to average 10 bags to the acre. The

Dun variety stooled well, grew fast while the ground was moist, but at the first signs of dryness in the soil it went to head, reaching a height of 20 inches. It headed well with a good plump grain, and was expected to go 7 to 8 bags.

Maize Experiments at Mr. T. Baker's Farm.

The thirty acres at Mr. T. Baker's farm on which maize was sown, was originally a rather poor, light, grey loam 6 to 8 inches deep, overlying a clay subsoil. Frequent working with dressings of farmyard manure between the crops has greatly improved both its appearance and friability. It has been in continuous cultivation for the past 20 years. When the previous crop, mixed sowing of Dun peas and Tick beans, which yielded an average of 9 tons 14 cwt. of green fodder per acre from the whole area, was cut on the last week in September, 1907, the ground was ploughed, disc harrowed, and cross harrowed. Fourteen acres were sown with maize in drills 2 ft. 6 in. apart, by a Musgrove seed drill, closing up three of each four hoes; 28 lbs. of seed to the acre were sown, and 1 cwt. of manure applied. The remaining 16 acres were again ploughed, and the manuring and sowing of each section done by hand, and covered with a light harrowing.

The seed was a very good sample of the ordinary Flat Red maize, purchased in Melbourne, the manure being a special maize mixture. The distance between the rows started at 2 feet, and in each plot, an increase of 6 inches was made up to 5 feet. The scarifier was kept going between the rows, and, notwithstanding a long period of very dry and windy weather, broken only by a few light showers, the maize kept steadily growing. Cutting was commenced on 7th January, and a record kept of the number and weight of loads per acre from the various plots. The return from the area which was drilled 2 feet apart, was the *lightest* of all, averaging 5 tons; the 2 ft. 6 in. paddock gave an average of 5 tons 19 cwt. per acre; the 3 ft. area yielded 7 tons 4 cwt. per acre; the 3 ft. 6 in. area returned 8 tons per acre; that 4 ft. 6 in. apart gave a return of 9 tons 15 cwt. per acre; whilst the 5 feet sowing fell back to 9 tons 4 cwt. per acre. This latter would suggest that the full necessary width for all practical purposes was reached in the *drilling at 4 ft. 6 in.* A light scarifier was put over the whole of the area sown as soon as the maize showed up sufficiently to mark the drills, and was kept going as long as practicable. In the narrow drills this, of course, meant the suspension of operations much sooner than in those sown wider. The extra working which was given these wider drills resulted in a much more robust growth. This would show that what is often looked upon as a loss of ground resulting from sowing a wide drill, is more than counterbalanced by the heavier return obtained. There is a dual benefit in this. As cattle will leave the heavier portion when maize is fed to them in the stalk, many farmers have made the mistake of striving for a fine growth in their crops; but the strong well-grown maize stalk has a higher feeding value than the same weight of a spindly growth. To use up this strong stalk necessitates chaffing; here again an absolute benefit and saving over the stalk feeding method is secured as when the chaffed fodder is used in a manger or feed box nothing is wasted, and the labour of chaffing is fully repaid. In addition, when the maize is chaffed other feed stuffs such as bran, crushed peas, brewers' grains, oilcakes, or any of the many concentrated foods popular among

dairymen can be added as required. Mixing feed in the bulk allows of each cow getting a more even share of the whole, and a second trip round the mangers is not necessitated. Every effort should be made to get as heavy a crop as possible from each acre of ground cultivated, and none of the produce should be wasted.

Each plot was cut in the order in which it was sown; consequently those cut last may, to some extent, have had an advantage over those sections cut earlier, in that by standing longer they may possibly have derived more benefit from the rain which fell in December. One trial cannot be deemed conclusive in determining the correct width of drill at which maize should be sown. The question to be demonstrated was whether wide or narrow drilling was the more satisfactory, and *the result was decidedly in favour of having the rows not less than three feet apart*, on account of the greater facility afforded for inter-cultivation and the resultant better growth.

MR. W. BAKER'S MAIZE CULTIVATION.

The area of 29 acres which Mr. W. Baker had set aside for his first sowing has a gentle slope to the south, and is of a mixed light and dark grey loamy soil, about six inches in depth, over a clay subsoil. This paddock has been under cultivation for the past seventeen years, and the crop preceding the experiments was tick beans and dun peas sown on the 14th and 15th of March, which averaged about 10 tons of green fodder per acre. About twelve years ago a few loads of peas were fed as a trial. When the cows had got used to the fodder there was a noticeable increase in the milk yield; and since that time peas have been sown annually by Messrs. T. and W. Baker for green fodder. Three years ago tick beans were added, mainly as a support for the growing pea haulm but the beans also proved a satisfactory addition to the feed from the stand-point of quality.

When maize is being fed the usual mixture for the day is about 3 tons maize, 1 ton hay chaff, 1½ tons brewers' grains, and 12 bags bran. When the maize is replaced by the peas and beans the bran is gradually reduced in quantity, as the peas mature, to 7 bags daily. Immediately after the pea crop was taken off the ground was given a light dressing of six loads of farmyard manure to the acre, ploughed, disc harrowed, and rolled. On the 6th and 8th November this was sown with 18 lbs. of seed of the ordinary Flat Red maize to the acre, with 1 cwt. of bonedust at the same time. The farm drill was used; three of every four drills were closed, leaving a space of 28 inches between the rows over the whole area. The land was then rolled and left for several weeks before being scarified; and the failure to have this work done earlier no doubt considerably interfered with ultimate success of the crop.

At this period Mr. T. Baker's crop received every attention, with the result that it forged ahead without check. Mr. W. Baker's crop, however, stood uncultivated till the weeds were well established, and its growth during the same period as compared with Mr. T. Baker's showed an apparent loss of 30 cwt. per acre. On the 14th, 15th and 16th January the crop received its only scarifying and the amount of actual benefit which the maize would have derived from it was considerably discounted by the way in which the work was done. Through the horse being hitched up close to its work instead of leading harness and light bar with long chain to cultivator being used, the result was that the low stiff set bar

in passing forced the maize stalks down, dragging many of the rootlets from the soil. This necessitated the plant making new root growth to establish itself, which materially interrupted its leaf growth.

The crop reached the flowering stage towards the end of January, and as fodder was required for the cows, cutting was commenced on the 3rd of February. The crop was still far from matured; the first acre cut yielded only 5 tons 16 cwt.; and the next gave 6 tons of fodder.

THE TWO SIDES OF THE FENCE—A CONTRAST.

BROADCAST MAIZE CROP.

DRILLED AND CULTIVATED.

A gradual improvement took place until the highest total of 8 tons per acre was reached in the cutting from the area on the flat. The maize was fed at the rate of 3 loads, approximately 2 tons in weight, per day to the herd of 268 cows and lasted for a period of eight weeks. Compared with some of the phenomenal yields recorded in various parts of the State this season this return looks very insignificant, but this district

can make no claim to being specially adapted for this crop, and a good return here would fall much below the average of other more favoured districts. The fact, however, stands that in the neighbourhood of these farms all others this season who followed the broadcast system of sowing have had next to no returns from their land, the crop in many instances being too short to be cut and having to be pulled by hand to gather it.

Before the cutting of the first crop was commenced Mr. W. Baker made his second sowing on 20 acres of virgin fallowed land, of which about 16 acres was low-lying, tussocky land, usually water-logged and boggy in winter, and a harbour for snakes and rabbits in summer. The remaining 4 acres were on slightly rising ground of a strong dark soil, bordering on some stony land, and which broke up fairly loose and mellow. The whole of the land which had been broken up about twelve months previously and re-ploughed twice subsequently, was now disced, and re-worked with a spring tooth cultivator. In the first week in January it was manured with 1 cwt. of bone dust to the acre and sown with 18 lbs. of maize per acre. Twelve acres were sown with the drill, as before,

A MORNING SUPPLY FOR THE HERD.

and four with a small drill attached to the plough handles. This machine was described in the March issue of this *Journal*. Its work in this instance was very satisfactory. The remaining 4 acres on the rising ground were sown with 2 bushels of maize per acre, broadcasted, in order to make the demonstration, if anything, more complete. The result was that fully twice as much fodder, proportionately, was cut from the drilled land as from that sown broadcast.

As the rainfall during the period when these maize crops were growing was very light in most districts, the monthly total registered on Mr. W. Baker's farm is of interest. As the two farms are only seven miles apart, and the intervening country is similar in contour, the records of one may be taken as approximately correct for the other.

1907.	Inches.	1908.	Inches.
May	1.59	January	.81
June	1.29	February	.45
July	2.14	March	1.86
August	1.59	April	.20
September	.63		
October	1.72	Total for 12 months ...	19.97
November	2.17		
December	5.52		

Both Messrs. T. and W. Baker place a high value on the manure from the farm animals, and none is allowed to go to waste. On the Woodstock farm it is carted to a heap in the paddock and is distributed just before the cultivation for each crop. At Somerton, all the spare time of the farm hands is employed in gathering and carting the manure direct to the paddock, where it is ploughed in at the earliest opportunity.

It may be said that the average dairy farmer could not afford the time taken up on both these farms in measuring the land cultivated and weighing the crops. The fact that two such practical men as the Messrs. Baker readily undertook these exhaustive tests indicates the high value they place on the knowledge gained. It is this determination to bring any questionable point as near as possible to a decisive finality, which marks the difference between the dairyman who secures average success and another who makes an eminent success of his work.

WASHING WHITE LEGHORNS FOR EXHIBITION.

H. V. Hawkins, Poultry Expert.

White fowls, and others of light colour, require washing all over. The requisites are plenty of hot water, a basinful of soapy water—made by dissolving cut-up soap in hot water—a nice soft sponge, and some dry towels. Having washed the feet and legs, fill a tub with water, hot enough for an ordinary bath, and sufficient to go round the body of the bird; care must be taken to thoroughly drench the bird to the skin. Part the plumage and work it about with the sponge under water; then rub the sponge, well soaped, into the feathers, up, down, and across; for the fluffy feathers in front use the hand, working it up and down. Continue working at the feathers until every particle of dirt is removed.

The next operation is to wash the head, sponging well round the eyes, the top of the head, and down the hackle. After this, place the bird in a tub of clean *warm* water—which will also do for washing the next bird—and rinse it well, taking care that the soap is thoroughly removed; otherwise, the plumage will become clogged, and will not web nicely. Having pressed out with the hands any soapy water, put the bird into a third tub of *cold* water to which may be added at least a tablespoonful of borax, which will assist in preserving that stay-white colour, which is desirable in the show bird. Then rinse quickly—but thoroughly. The cold bath will have the effect of closing up the pores, thus minimizing the risk of the bird taking cold. Place the bird on a table, and remove any water that remains with a sponge, squeezed dry; then, using a towel, dry the head, wipe down the neck, and sop the rest of the body, always working the way of the feathers. A stimulant may now be given—20 drops of ammoniated tincture of quinine to a tablespoonful of milk. When this is done put the bird in a crate placed before a fire with a strong glow of warmth, avoiding a fierce heat, and, from time to time, turn the crate until the bird is nearly dry, but still damp. Remove it to a lined exhibition basket placed in a warm, but not hot, position, the object of this final drying being to secure a slightly moist atmosphere so that the plumage properly webs again. Birds may be washed three or four days prior to exhibiting. They will keep perfectly clean if there is plenty of chaff in the pen, and the droppings are frequently removed.

INFLUENZA IN HORSES.

S. S. Cameron, M.R.C.V.S., Chief Veterinary Officer.

For anything approaching a parallel to the severe visitation of illness that has befallen the horse population of Melbourne and suburbs during the last few days, the early winter months of 1890 must be re-called. Just as at the present time the human population is showing a distinct vulnerability to the influenza germ, so about the time in 1890, when the horse epizootic prevailed, it will be remembered that the community was in the throes of the epidemic of what was then called Russian influenza or "la grippe."

The present visitation, however, is apparently more marked, both in the proportion of horses attacked and in the severity of its effect; and it promises to more closely resemble the historic occurrence of influenza in the Northern States of America in 1872-3, when about a million horses altogether were attacked, and the death rate ran to upwards of 5 per cent.

INFLUENZA OF HORSES AND MAN NOT IDENTICAL.

It should be made clear that the influenza of man and of horses are not identical, inasmuch as they are not caused by the same germ and are not inter-transmissible from man to the horse and *vice versâ*. The causative agent in the illness of man is a specific germ called Pfeiffer's bacillus, which will not cause the disease in horses. While the causal germ of the disease in horses has not as yet been definitely demonstrated, weighty evidence points to its being the cocco-bacillus of Lignieres. Nevertheless, the two diseases are remarkably similar as regards contributory causation, symptoms, progress, complications, and all other features.

ANNUAL OUTBREAKS.

Slight and almost unnoticed outbreaks of influenza in horses would appear to occur every year, the disease apparently smouldering on in city stables from year to year until it breaks out without any very obvious cause into a live, active, and virulently infectious epizootic, such as the present one. No known conditions of temperature, atmosphere, soil, or seasons are associated with the occurrence of an outbreak, but there are certain well-known factors, some of which would appear to have effect as contributory causes in connexion with every recrudescence of the disease in virulent form. One of them is the "chill," which is sustained as a result of the sudden vicissitudes of atmospheric temperature prevalent during the autumn and spring months associated as these are with the "change of coat," which is going on at such seasons. The electric tension of the atmosphere associated with the occurrence of thunderstorms has been held to lower animal vitality and so increase susceptibility to attack. In this connexion it is worthy of note that there were several thunderstorms during the second week in September when the outbreak of influenza was first noticed. Exposure to cold and damp situations are potent predisposing causes. Neglect, overwork, and improper feeding also contribute to an extension of the ravages of the disease.

Predisposing Causes.

In this last pre-disposing cause may perhaps be found the most reasonable explanation of the causation, extension and severity of the present visitation. Although the sudden development of the disease amongst horses in the metropolitan area was only noticed last week, nevertheless influenza has been prevailing over wide areas in the Northern districts of the State during the whole winter, particularly in the district lying north of Bendigo and between Mitiamo and Echuca. Veterinary Officer Cother, who investigated the disease in that part of the State, makes the following observations in his report:—"This year a long dry summer following a dry spring in which there was little growth opened up but a poor winter prospect for animals in the district. The phenomenal rainfall at Christmas time broke up the old grass, and left the pastures bare. There was no autumn spring of grass, for the same downpour germinated the surface seeds but the resulting plants were quickly withered. Feeding by hand had to be resorted to, and, owing to the scarcity and consequent high prices, the use of hay was out of the question to those who had none on hand. The high prices tempted those who had stocks to sell; consequently the only feed available was straw chaff. The autumn rains upon which the winter feed depended having failed, feeding had to be continued well on in to the winter, which was ushered in by cold rains, accompanied by heavy frosts and fogs. At that time, when it was most important that it should be persisted in, some farmers discontinued feeding. The conditions to which the horses were exposed ill-fitted them to withstand an attack of influenza. Their vitality and recuperative powers had become so lowered that it is not to be wondered at that many rapidly succumbed. That the greatest mortality should have occurred amongst the younger horses may be explained by the fact that never having been previously exposed to the influenza poison they had not acquired the immunity that older horses had; and were in an early stage of growth, when the demands of the animal economy are largest, and consequently a greater amount of nourishment is required to meet those demands. As this was not forthcoming the susceptibility of the animal to disease was at its maximum. Older horses, with their more or less acquired immunity, and with, in most instances, better care, although not so susceptible, have not altogether escaped."

Effect of Improper Feeding.

The semi-starvation conditions described by Mr. Cother as contributing to the extension of the disease in country districts have applied also to city horses during the past winter. The shortage and consequent high price of horse fodder has led to the use of inferior, adulterated and damaged feed for horses to a greater extent than ever before in my experience. The effect of this innutritious and deleterious feed has been shown in many ways, notably in the impoverished appearance of city horses as compared with other years, and in the extraordinary prevalence during the last month or so of a semi-chronic indigestion amongst horses so fed. This latter has been manifested by dryness, scurfiness and itchiness of the skin, and dullness of coat, with a marked tendency to harness chafing and abrasions of the coat and skin, conditions much more in evidence during this than ordinary years.

The foregoing facts being considered, the virulence and all-round incidence of the present epizootic is easy of explanation. The influenza

infection came along—possibly brought to the city by country horses mobilized by the military authorities for the Fleet week celebrations—and caught the equine population of the city in an impoverished condition with an all-round lowered vitality and with its powers of resistance against disease invasion at the lowest possible point: vulnerable to attack and an easy prey. Hence the rampant spread of the disease and its more than usual severity in individual cases. As indicative of the extent and virulence of the disease, as also of its sudden onset, the case may be mentioned of a city firm with seventy horses all well on Friday evening, while by the following Sunday morning all but four were under treatment and already four cases of "founder" had developed. In many of the larger stables in the city 80 per cent. of the horses are prostrated with the complaint.

SYMPTOMS.

The first symptoms may develop in from one to three days from the time the horse has been exposed to the infection. The symptoms persist in one form or another throughout the attack, which, in cases which recover, will run its course in from six to ten days. Of course, at the end of this period the horse will be in a much weakened state, and unfit to resume work until convalescence is complete. The disease is of a febrile type, and, as mentioned above, its onset is very rapid and marked by extreme prostration and dejection. In a simple case, there is high fever, the head hangs low, the eyelids are swollen, there is an effusion of tears, and the eyes are sensitive to the light. The throat is very sore, making swallowing very difficult. The appetite is impaired; the patient may take a small mouthful occasionally, but will not complete the mastication; and the thirst is great. The urine is high-coloured and scanty, staling of small quantities at frequent intervals. The fæces are also scanty, a few small balls covered with mucus being passed. The patient is indisposed to move, and, if made to do so, staggers and sways with weakness. The sore throat is mostly accompanied by a cough, and may also be associated with an external swelling or fulness of the throat. The internal temperature is usually increased. It may run from 104° F. to 107° F.—a rise of from $2\frac{1}{2}$ to $5\frac{1}{2}$ degrees above normal. A temperature above 103° F. is indicative of the thorough establishment of the complaint and the necessity for rest and appropriate treatment.

In an ordinary case the pulse may not be greatly disturbed and any considerable increase from the normal (40 beats per minute), say to 60, 80, or 100 beats should be taken as premonitory of definite inflammation of some internal organ. The breathing is quickened particularly in those cases which tend to develop pneumonia. The inside of the eyelids and the eyeball are abnormally reddened, and, in cases with liver complications may present a yellowish tinge.

The previously mentioned disinclination to move would appear to indicate, in the light of one's personal sensations during an influenza attack, the presence of severe aching pains in the muscles. This is especially suggested when an attempt is made to turn the patient round; the head, neck, and body are allowed to partly swing round before the limbs are moved, and as much space as possible is taken to turn in. Forcibly turning the patient in a short space distresses him considerably and is generally productive of a prolonged grunt or groan.

These are the most commonly manifested symptoms in an ordinary, benign case. In those in which complications occur, symptoms are presented which are specially indicative of the disease which is developed.

Complications and Sequelæ.

The most serious aspect of influenza is its liability to complications, and what may appear to be a severe cold may develop into a serious attack of inflammation of the lungs, intestines, or joints. In those cases where inflammation of the lungs (pneumonia) supervenes, death often takes place with startling suddenness. A horse that had been seen apparently well a few hours previously may be found dead. The pneumonia is frequently double, that is, both lungs are involved. The difficulty of breathing is very pronounced. It is stated that in the present outbreak the tendency to complications having their seat in the lungs is greater than usual.

In the intestinal form of the disease, in addition to the primary symptoms, there is slight colic and uneasiness. The state of constipation will be succeeded by diarrhœa, the fæces being watery and escaping from a constantly open fundament, with much straining to evacuate. Death may ensue by the third or fourth day. In a small percentage of cases inflammation of the feet follows on the premonitory symptoms and the horse becomes "foundered."

Other troubles may supervene. There may be the development of abscesses about the throat, joints, or internally. Rheumatism of muscles and joints, with accompanying lameness, is of frequent occurrence, and swellings on head and limbs are common. Recovery, however, takes place in the majority of cases if care and attention are given, the disease running its course in from six to ten days.

Nursing and Medical Treatment.

The prime essential is rest. The medical man orders the influenza patient to bed immediately, and warns him against attempting to battle the disease out while performing his ordinary work. So with horses: few of the cases will develop into anything serious if the patients are relieved of work immediately.

During an attack of horse influenza good nursing is of supreme importance. Unless steps are taken to insure the patient's comfort, the giving of medicine will be futile. He should, therefore, be placed in a roomy, well ventilated, but warm box, with plenty of bedding, and should be well clothed and bandaged. Plenty of pure water to drink, frequently offered in a clean bucket, is desirable. A teaspoonful of saltpetre or of chlorate of potash may be dissolved in each half-bucket of water. Greenstuff, if available, should be presented in an appetizing manner. Gruel, milk with eggs beaten up, linseed or hay tea, boiled oats or barley—in fact, anything that will tempt the patient to eat—should be offered. Only small quantities of food should be offered at a time, and any food that is not immediately eaten should be taken away. Nothing nauseates a horse quicker than allowing stale or mouthed food to remain in front of him when he has no desire for it.

As a homely and readily available remedy, three ounces of whisky four times a day, with one drachm of quinine in it twice a day, may be given. An ounce of sweet spirit of nitre may be substituted for the whisky. When convalescent, one drachm of extract of gentian may be substituted for the quinine. In a simple case, inhalations of hot water vapours (steam), into which a little eucalyptus oil has been introduced, is good. A stimulating liniment applied to the throat will be serviceable. In cases where there is difficulty in swallowing, medicine in the liquid form should not be given.

In such cases, portion of the drench is apt to pass down the wind-pipe, in which case grave lung complications will follow. Instead, an ammonia ball (as prescribed below) should be given twice a day; or an electuary, consisting of belladonna extract and chlorate of potass., two drachms of each with a sufficiency of treacle, should be smeared on the teeth three times a day.

In the lung cases, liniment or mustard paste may be applied to the sides of the chest. The constipation may be relieved with injections of warm soap suds. Purgative medicine should not be given, one peculiarity of influenza being the extreme irritability of the lining membrane of the bowels and the consequent intense response to purgative or even laxative medicine, whereby violent purgation and inflammation of the bowels may be readily induced.

In the intestinal form of the disease this constipation will be succeeded by diarrhœa, when the linseed tea will be useful. A solution of gum may be added to the drinking water, and laudanum given in ounce doses twice a day. Where the attendant can administer a ball, perhaps the best medicinal treatment throughout the attack is to administer twice or three times daily a ball composed of ammonium carbonate, gentian and ginger, of each two drachms.

PREVENTION OF SPREAD.

Influenza being essentially a contagious disease, means of prevention or limitation of its spread should be in the direction of preventing infection. The disease does not seem to spread through the air. Either immediate or inter-mediate contact with an infected horse is necessary for the infection of other horses. The inter-mediate contact may be supplied by attendants, the germs being carried on their clothing or hands. But without doubt, the spread of infection is most certain when horses are allowed to eat from mangers previously used by infected horses, and drink from water troughs previously contaminated by the discharge from an infected horse. It may be taken as likely that every street water trough in Melbourne is, at the present time, contaminated with influenza infection. Suggestions for the daily cleaning of street water troughs are, in the absence of State or municipal power to enforce, not likely to be very generally adopted; and there is not much merit in the suggestion for running water to be continuously provided, as the contamination of the frame of the trough would not thereby be prevented. A safer plan will be to urge every one controlling such troughs to keep them empty, so that they may not be capable of being used during the continuance of the epizootic. At any rate, drivers should rigorously avoid allowing horses to drink at street water troughs. In stables, if possible, a separate drinking bucket should be used for each horse, or the stable bucket should be thoroughly cleansed with boiling water and washing soda every day.

Incidentally, it may be here remarked, what a danger the horse watering troughs in the streets of Melbourne would be in the event of the introduction of any seriously virulent horse disease like Glanders! Such a disease would spread like wildfire, and would quickly leap beyond control. The abolition of horse troughs was called for in the cities of England many years ago, and their continuance in Melbourne is a fertile means of spread of such equine diseases as Strangles, Pneumonia, Influenza, and the like. Convenient they may be, but any advantage they are in that respect is

far outweighed by the present harm that regularly results and the menace they would be if Glanders or other such exotic disease of horses was introduced.

Disinfection.

Stables, both those that are as yet clean as well as those that are infected, should be thoroughly cleansed and disinfected—particular care being given to the mangers, floors, and drains. The mangers should be scrubbed clean with hot water and a liberal allowance of washing soda. Walls, partitions, floors, and drains, should be cleansed and flushed with a solution of chlorinated lime of a strength of about half a pound of chloride of lime to a gallon of water. Lime washing the walls and surfaces with carbolized lime wash (a pint of crude carbolic acid or phenyle to the bucket of wash) may also be carried out with advantage.

The infection is regularly spread from one locality to another by means of the manure and litter from stables. Consequently during the existence of the epizootic, stable manure should be burnt or buried in all cases where at all possible. In other cases it should be freely sprinkled with chlorinated lime solution.

Antitoxin Treatment.

An Influenza Antitoxin is prepared by Messrs. Parke, Davis, and Co. for use as a preventative and curative agent in equine influenza. It is administered by injection direct into the veins—usually the jugular vein —and therefore can only be used by an expert operator. Certain of the practising veterinary surgeons in Melbourne have already adopted this scientific means of subjugating the disease amongst valuable patients; and if the severity of the outbreak does not abate, it would be a wise proceeding on the part of large owners to adopt this line of treatment more extensively.

Advice to Owners.

During the continuance of the outbreak, in all cases whenever a horse commences to cough or show any of the other symptoms of the disease, throw him out of work immediately. Nurse him, coddle him, bandage his legs, keep him warm, groom him frequently with straw wisps or woollen cloths, and keep up his strength by nutritious feeding. Carry out the disinfection measures and the home treatment advised above. If, instead of getting better, he appears to be getting worse, or if any complicating or untoward symptoms appear, a veterinary surgeon should be given charge of the case. Indeed, in all stables of any extent where the infection has appeared, the provision of qualified veterinary attendance from the start is wise and economic.

The daily taking of the temperature of all horses in the stable is to be recommended, so that, if the temperature is seen to rise above 102° F., the pending development of the disease may be forestalled, and the horse rested and given appropriate attention as outlined above.

GARDEN NOTES.

J. Cronin, Principal, School of Horticulture.

The Magnolia.

Magnolia is a genus of shrubs and trees, many of which are highly ornamental and sufficiently hardy to endure the conditions prevailing in gardens in most parts of the State. Various species are deciduous and produce their flowers in spring immediately before and during the period that the leaves are beginning to develop; others are evergreen and bloom during the summer months. Magnolias are found native in Eastern Asia and North America. Most of the deciduous species in cultivation in Victoria are natives of China and Japan. Under natural conditions some kinds attain a height of over fifty feet, but the largest trees grown here fall far short of that standard, well grown specimens of Magnolia grandiflora rarely exceeding a height of thirty feet. Magnolia grandiflora lanceolata is the most generally known of the evergreen kinds, and is certainly one of the finest ornamental trees in cultivation. The deciduous kinds, which are worthy of more extended culture, may be seen in many gardens in the cooler districts. The flowers of most Magnolias are tulip-like in form, of large size, the petals being stout in texture and of clear lustrous colour, and in most cases the flowers are very fragrant. Fine examples of various deciduous species and varieties may have been seen blooming at the Melbourne Botanic Gardens in September.

Culture—Selection—Propagation.

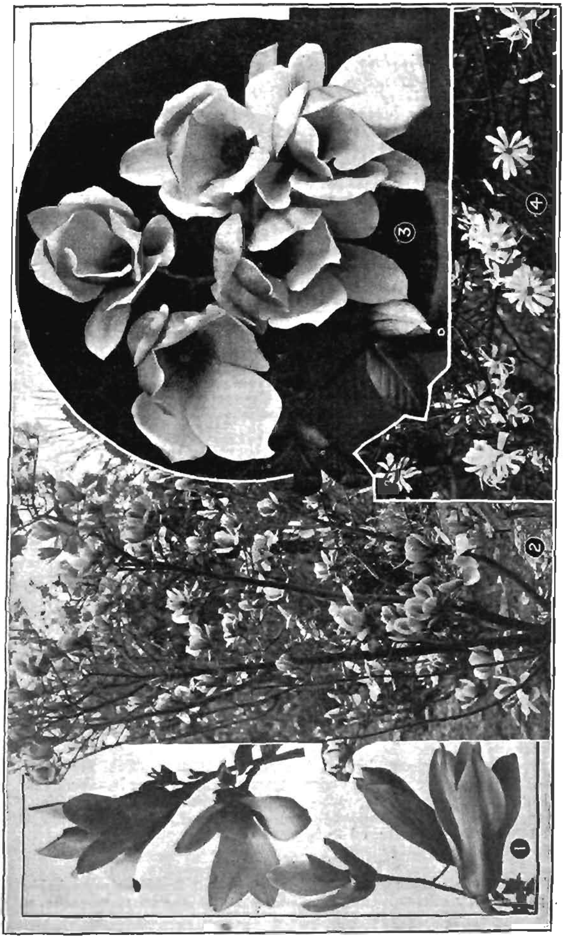
Magnolias generally require a fairly rich and porous loamy soil to insure free healthy growth and abundant bloom. They will not thrive in stagnant soil, but a fair amount of moisture is needed during the growing season to develop the growths and flower buds; established plants will endure severe weather conditions if the soil is well cultivated and moisture thereby conserved. Newly planted specimens need some attention in watering, mulching &c. until established. Soils containing a heavy percentage of lime are considered unsuitable for the cultivation of Magnolias. The most suitable time for planting is in early spring. The roots of most kinds are of a fleshy nature and are likely to decay if placed in saturated soil in winter.

Fairly sheltered, but unshaded, positions should be provided if possible; the plants require fair sunlight, but without protection from severe wind the foliage and flowers of the deciduous kinds are damaged and spoiled. Magnolias are admirable subjects for large borders, or groups, or for planting as specimens on lawns, for which purpose M. grandiflora is eminently suitable.

Propagation is effected by layering, grafting in many cases, and from seeds. Where seeds can be obtained the plants can be easily raised, but skill and propagating plant are necessary to increase plants by grafting. Layering is an easy method of propagation, the details being identical with those frequently referred to in these notes.

Species and Varieties.

The following kinds and varieties which are all deciduous are suitable for gardens of moderate size :—Magnolia stellata,—the starry magnolia, a



1. MAGNOLIA OBOVATA. 2. M. CONSPICUA. 3. M. SUPERBA. 4. M. STELLATA.

beautiful dwarf species producing white flowers, differing from other magnolias in the number and arrangement of the petals. The petals are narrow, more numerous and arranged in flat, star shaped form instead of the characteristic cup shape. A new variety of the above, M. stellata rosea, bearing pale rose flowers, has been lately imported from Japan, and should be a valuable acquisition. M. conspicua, the Yulan, is one of the finest. It grows and blooms freely in the metropolitan district, the flowers being white, large, erect, and fragrant. M. obovata is a dwarf hardy kind, the flowers of which are purple without, and white within. This kind is easily propagated by layering. It is frequently used as a stock for the kinds that are rare or difficult to propagate. M. spectabilis is hardy and dwarf; the flowers are large and resemble those of M. conspicua. M. superba is a variety of garden origin, of moderate growth, producing flowers of a beautiful pink shade. It is one of the finest deciduous kinds. M. Soulangeana, Lennei, and others are worthy of culture.

Of the evergreen species, M. grandiflora, and M. grandiflora lanceolata are well known and popular kinds, producing immense white flowers of great fragrance. These are suitable for planting as avenue trees. M. fuscata, the Port-wine Magnolia, is a dwarf evergreen shrub, producing purplish brown flowers in summer, the perfume of which strongly resembles the smell of port wine. The latter plant is now classed by botanists as Michelia fuscata.

Flower Garden.

The work of soil cultivation, planting, seed sowing, and destruction of insects, &c., recommended last month should be continued in a great measure during the present. As early flowering annuals fade they should be removed, and their place filled by transplanting, or sowing seeds of, plants that will bloom during summer and autumn. A number of plants that will make the garden bright during autumn may be raised from seeds sown now. Many tender or half-hardy annuals grown for the beauty of their foliage or flowers, such as amaranthus, coleus, balsams, celosias, &c., may be planted out when danger from frost has passed. Salvias "Bonfire" and "Gloire de Studgardt," commonly known as Glory of Stuttgart, are popular plants for bedding or producing bright patches of flowers in groups or borders. They may be raised from seeds, or from cuttings of the old plants of last season. Various plants known under the general classification of bedding plants may be set out, including iresines and alternantheras.

Beds for the reception of dahlias should be prepared. A deeply worked, well drained, and rich soil is necessary for the production of fine blooms. Dahlias may be planted now if flowers are desired during summer. Divisions of the tubers or young plants from pots will provide large plants that will bloom in about three months.

Kitchen Garden.

Growing crops should be kept free from weeds by frequently hoeing between the rows. Thinning the plants and hand-weeding should also be attended to in good time, or the result from the crops is almost sure to be disappointing.

Cucumbers, melons, marrows, raised under hot frame conditions may be planted out, and seeds may be sown where the plants are to remain.

Little is gained as a rule by extra early planting of cucurbitaceous plants, a severe frost or sudden change to a fairly low temperature being a common experience and one that effectually checks the early plants. Warm sunny positions should be given to water-melons to enable them to ripen during the warm weather, the season of demand for the fruit.

Seeds of various vegetables, including French beans, peas, cabbage, turnip, and various saladings may be sown, and plantings made from former sowings as required.

THE ORCHARD.

James Lang, Harcourt.

Splendid rains have again fallen since last month, and the outlook for a good season is very much brighter than it was two months ago. The weather has been very changeable during the past few weeks, and the extreme cold experienced has retarded the blooming of the trees; however, a few warm days will soon bring the blossom out, and, unless cold weather again sets in, the season will be as early as usual. Fruit trees of all kinds give promise of heavy crops, and in the absence of hot winds or frosts during the blooming period, the crop will be a record one.

Ploughing the orchard should now take precedence over all other work, and be pushed on and completed as soon as possible; once the ground is turned over it is an easy matter to keep it well stirred up during the summer.

Where peas were sown down during the autumn they should be ploughed in at once before the weather gets too dry. Roll them down with a heavy roller, and plough in with a plough fitted with a circular colter to cut the peas; plough the same way as the peas have been rolled—only roll down a space that can be ploughed in during the day, as, if left too long, the peas commence to rise up, when it is difficult to make a good job of turning them in.

The cold showery weather which has been experienced is very favorable for the propagation of the Black Spot of the apple and pear. Growers will therefore have to spray with the Bordeaux mixture at the proper time—just when the flower is about to burst. To keep the disease in check, another spraying should be given later on when the fruit is well set.

Peach trees also will require attention for the aphis and curl in the leaf.

Spray also for codlin moth as recommended in last month's notes. The trees should also be bandaged to trap the grub when it leaves the apple; by doing this a check is kept on the spraying, showing whether it is effective or not; if effective, very few grubs will be found in the bandages, which should be examined every ten or twelve days, and all grubs found destroyed.

Strawberry plantations should now be cleaned up, and kept free from weeds by scarifying at every available opportunity. A layer of straw spread around the plants as a mulch keeps the fruit clean, and prevents the evaporation of moisture.

Citrus fruits can also be planted now, where a supply of water is available to water them during the dry weather.

Grafting apples may still be done if the scions are in a backward state. When the scion starts into growth, rub off all shoots below the graft.

THE APPLE EXPORT TRADE WITH THE UNITED KINGDOM AND GERMANY, SEASON 1908.

A Critical Review.

Ernest Meeking, Inspector under the Commerce Act.

Never did an apple export season open under more auspicious circumstances and with better prospects than the one under review. The reports from the United States of America and Canada, 1907, indicated that there would be a shortage in the apple crops of those countries, and our exporters and growers had reasonable grounds for supposing that foreign markets would be depleted of American stocks long before shipments from Australia would arrive, thus leaving a clear field for the disposal of our fruits. The high prices realized in the preceding season, although establishing a record so far as the quantity exported was concerned, added also to this optimistic impresson. This prediction was also expressed in the report on the 1907 season, published in the *Journal* for July, 1907. However, these hopes were doomed to disappointment as last season proved to be one of the most disastrous in the records of our fruit export trade. The reasons for this failure seem rather difficult to account for, and have apparently arisen through a multiplicity of causes. This unfortunate state of affairs has aroused a great deal of controversy amongst exporters, and the public press has been freely utilized to ventilate their reasons for its occurrence. Feeling has run rather high in many instances, and a certain amount of recrimination has been indulged in. As these opinions have necessarily been coloured by the trade interests of those by whom they have been expressed, it may hardly be supposed that any go thoroughly to the root of the matter. There is not the slightest doubt that all the different influences mentioned by the disputants have added their quota in contributing in a greater or lesser degree to bring about this untoward result; but there appear to be other causes which have apparently escaped the attention of the controversialists.

It seems obvious enough that if our products are not sufficiently and properly pushed before the right people at the other end, a "slump" in prices, such as was experienced last season, must nearly always result. For want of co-operative organization among the exporting growers and the presence of an active agent working solely in their interests, many of the producers of this State are compelled to submit to the same discouraging experiences year after year. Under the present system there is not the slightest doubt that when our fruits are "put up" for public auction and sold in various small lots, the careful and painstaking exporter is penalized through the manner in which his less careful fellow exporter makes up his consignment. This may be rendered more clear when it is explained that each line of fruit is usually sold upon the appearance and general merits of a single case which is opened at the side and exposed for the decision of the buyer. Under these circumstances it may so happen that a case from a line of fruit which has been carefully made up and graded, may, by chance, happen to be the most inferior case in that line; whilst a case exposed from another line, which, although not containing, on the average, as good or carefully packed fruit, may happen to be the best case in that line; consequently the absurd position may arise that

the inferior line of fruit realizes more than the better one. Reliable authorities state that such a contingency often occurs during the sales in Covent Garden. Were an impartial agent present, well acquainted with the merits of the fruit sold under the different brands, to act conjointly in the interests of the various exporters, this agent could, in instances where he thought that a line of fruit was being sacrificed, order such line to be passed in. He could then endeavour to profitably dispose of it either by cool-storing until a rise took place in the market or by disposing of it himself to the retailers direct; or, if necessity arose, by sending it to another market. An instance of the benefits arising from the latter course may be quoted in connexion with a consignment of fruit shipped last year from the Leongatha Labour Colony. The agent who had charge of the sale of this consignment, not being satisfied with the price offered in London, shipped it to Glasgow and received a substantial advance on the London price. His efforts in this direction were rewarded by the realization of a handsome profit. It is an established fact that goods of any description seldom, if ever, bring their full value when put up for public auction.

One prominent grower and exporter, writing to the press, assumes that "there is a possibility of a commission agent being a dealer as well." This is an open question, but if such be the case it would certainly be to the advantage of the agent to obtain low prices. However, there appears almost certain ground for believing that our fruits were not given fair treatment in the European markets this year.

Other reasons quoted have been the stringency of the money market, the unfavourable English season, the inferior quality of the fruit shipped, the high charges for freight, inferior packing and grading, and the quantity of foreign apples on the market. Regarding the first of these, it is well known that during the recent financial crisis in the United States large sums in gold were shipped from England to the States, thus causing a tightness in the money market which would be felt as severely in the fruit-trading world as elsewhere. Concerning the second reason, the temperature in Great Britain underwent many surprising fluctuations during the months of April, May and June. With the miserably cold conditions that succeeded the warm weather of the Easter holidays there was little demand for fruit of any kind. These were followed by the warm days of the early summer, causing a rapid ripening of strawberries, cherries and other soft fruits of the northern hemisphere. The third cause, viz., the inferior quality of the fruit shipped is, unfortunately, only too true, and may, perhaps, be quoted as the principal reason for the lowness of the prices obtained. This inferior condition was partly due to the fact that the shortage of the season's crop was so marked that there was very little prime fruit to select to fill space which had been booked weeks ahead; hence growers were compelled to send the best of a generally poor lot which, although inferior in size, appearance and general quality, were not actually diseased and could not, therefore, be rejected by the inspectors. Owing, perhaps, to the effort put forth by the trees in producing last year's abnormally heavy crop, the cells of the fruit would be lacking in vigour and render them more susceptible to premature decay and deterioration. The assertion that a healthy organism will resist disease and decay more successfully than an immature and unhealthy one applies with equal force to the vegetable organism as much as it applies to the animal organism. This emphasizes what has already

been quoted in previous articles in this *Journal*. It would appear as though the researches into this subject would start at the very beginning, that is, in the orchard itself, and attention should be given, as is done in the United States of America, to the causes which influence the constitution and keeping qualities of fruit grown under various conditions. Experiments should be conducted in the way of pruning with a view to equalizing, as much as possible, the output from the trees each succeeding season and thus prevent exhaustion through the production of abnormally heavy crops. It should be borne in mind that the keeping quality of the fruit is impaired when the trees are weakened, apart altogether from the question of disease. Immature fruit apparently deteriorates and decays much more rapidly than vigorous well-developed fruit even without the presence of disease as a contributing factor.

The "Bitter Pit" problem is one that also requires solution as it appears to be about the worst enemy with which the exporter has to contend. The offer of a bonus for the discovery of a remedy would undoubtedly be politic under present circumstances.

It seems a pity that some means could not be devised whereby the shipping companies could be compelled to rigidly pay the strictest attention to the matter of fluctuations in temperatures, &c., during the time the fruit is in transit. If it could be made a stipulation that each boat carry a self-registering thermometer, showing every fluctuation during the voyage, and that a strict account be rendered to the Agent-General at the other end of all the conditions which have obtained during transit, it would probably be found that a great deal of the deterioration and waste which now occurs would be avoided. There seems to be no room for doubt that the fruit, as a whole, is carried at too high temperatures.

Provision should also be made for chilling fruit before being placed on board the exporting vessel. Every hour at which fruit is kept at high temperatures after being picked hastens its decay. If fruit were chilled before being placed on board a vessel for export many fluctuations in temperature could thereby be avoided. For instance, a vessel may load some thousands of cases of fruit in one port and after some days call at another port and place amongst the fruit which is already chilled, cases which are many degrees higher in temperature. This has the effect of raising the temperature of all the fruit in the refrigerator and retards its keeping qualities.

Something in the way of reduction in freights should also be attempted, as the grower should be enabled, under proper conditions, to realize a profit when obtaining any price above 6s. in the European markets for his fruit. There are, apparently, so many aspects of this question of successful fruit export which demands attention that united action on the part of the growers or the Government, or both, seems imperative. The scientific and business sides of the question both require to be carefully attended to, and a plan of campaign mapped out before united action is taken.

Regarding inferior packing and grading, it may be safely said that Victoria offends less in this direction than any of the exporting States. There seems little room for doubt that much improvement could be effected and the difficulty could, perhaps, be met by the insertion of provision in the schedules of the Commerce Act Regulations for the standardizing and grading of fruits. The matter seems to be rather a difficult one, as it would appear that a standard would be required for every variety of

Per *Britannia* (London) sailed 18th February, 1908.

Variety of Fruit.	Highest Price. s. d.	Lowest Price. s. d.	Average Price. s. d.
APPLES.			
Adam's Pearmain ..	14 6	8 3	10 9
Alfriston	10 0	9 3	9 10
Annie Elizabeth ..	13 0	10 0	10 5
Baldwin	11 0	7 0	9 0
Ben Davis	8 9	6 3	7 2
Cleopatra	15 6	10 0	13 0
Cox's Orange Pippin ..	15 6	6 6	11 2
Emperor Alexander ..	9 3	9 3	9 3
Esopus Spitzenberg ..	13 0	13 0	13 0
Golden Pippin	12 6	12 6	12 6
Jonathan	18 0	8 6	11 1
King of Pippins ..	12 6	8 9	10 3
Margil	5 0	5 0	5 0
Munroe's Favourite ..	15 0	10 0	12 0
Perfection	9 9	9 9	9 9
Prince Bismarck ..	8 9	5 0	7 8
Prince of Pippins ..	11 0	8 0	8 11
Reinette de Canada ..	9 0	7 9	8 4
Ribston Pippin ..	14 6	6 0	9 5
Rome Beauty	10 0	8 6	8 11
Rymer	11 6	7 6	8 8
Wolseley	9 9	9 9	9 9
PEARS.			
Beurré de Capiaumont ..	4 0	1 0	2 5
Beurré Diel	5 3	2 8	4 6
Beurré Bosc	3 9	2 4	3 1
Burkeman	5 0	4 0	4 3
Backhouse's Bergamot ..	2 6	2 6	2 6
Bergamot	3 6	3 6	3 6

Per *Grosser Kurfuerst* (Hamburg), sailed 25th February, 1908.

Variety of Fruit.	Highest Price. s. d.	Lowest Price. s. d.	Average Price. s. d.
APPLES.			
Adam's Pearmain ..	8 9	6 0	6 8
Cleopatra	16 0	7 6	10 10
Jonathan	16 0	5 3	8 9
Munroe's Favourite ..	17 0	6 3	11 10
Prince Bismarck ..	6 0	6 0	6 0
Reinette de Canada ..	12 9	12 9	12 9
Tompkin	7 3	3 9	7 0

Per *Carpentaria* (London), sailed 25th February, 1908.

Variety of Fruit.	Highest Price. s. d.	Lowest Price. s. d.	Average Price. s. d.
APPLES.			
Adam's Pearmain ..	9 0	6 9	8 0
Alfristons	6 9	6 9	6 9
Blenheim Orange ..	7 0	7 0	7 0
Cleopatra	11 0	5 9	8 8
Cox's Orange Pippin ..	17 0	7 3	12 9
Dumelow Seedling ..	12 6	8 0	10 2
Emperor Alexander ..	6 6	6 6	6 6
Jonathan .. .	11 6	5 6	8 11
London Pippin ..	8 0	6 9	7 4
Munroe's Favourite ..	8 6	5 9	6 3
Prince Bismarck ..	6 9	6 0	6 4
Reinette de Canada ..	7 6	5 6	6 3
Ribston Pippin ..	9 6	5 9	6 8
Rome Beauty	7 0	5 6	6 7
Rymer	8 3	6 9	6 11
Wellington Pippin ..	8 3	7 6	7 8

Per *Solingen* (Hamburg and Antwerp), sailed 3rd March, 1908.

Variety of Fruit.	Highest Price. s. d.	Lowest Price. s. d.	Average Price. s. d.
APPLES.			
Adam's Pearmain ..	9 6	8 0	8 8
Ben Davis	7 3	7 3	7 3
Cleopatra	12 0	7 3	9 10
Dumelow Seedling ..	10 0	9 0	9 10
Jonathan	13 3	6 9	10 3
London Pippin ..	15 9	7 0	11 3
Lord Wolseley	9 3	9 3	9 3
Munroe's Favourite ..	15 3	6 0	10 2
Reinette de Canada ..	8 6	8 6	8 6

Per *Mooltan* (London), sailed 3rd March, 1908.

Variety of Fruit.	Highest Price. s. d.	Lowest Price. s. d.	Average Price. s. d.
APPLES.			
Adam's Pearmain ..	12 0	11 0	11 10
Annie Elizabeth ..	8 6	8 6	8 6
Ben Davis	9 9	6 6	9 0
Cleopatra	15 0	8 9	12 9
Cox's Orange Pippin ..	17 6	8 6	10 9
Dumelow Seedling ..	14 0	9 0	11 10
Esopus Spitzenberg	13 6	8 0	10 8
Emperor Alexander ..	9 0	9 0	9 0
Five Crown	12 0	5 0	8 8
French Crab	9 6	9 6	9 6
Golden Pippin	9 6	9 6	9 6
Jonathan	14 0	5 0	12 6
Munroe's Favourite ..	13 6	7 6	11 1
Newtown Pippin ..	9 6	9 6	9 6
Perfection	9 0	9 0	9 0
Prince Alfred	11 0	6 0	9 6
Reinette de Canada ..	10 0	4 0	6 0
Rome Beauty	11 6	3 6	9 8
Rymer	12 6	8 3	10 0
Ribston Pippin ..	10 6	10 0	10 1
Scarlet Nonpariel ..	9 0	9 0	9 0
Schroeder	8 0	8 0	8 0
Statesman . ..	9 3	7 6	8 7
Stone Pippin	12 0	9 3	10 4
Sturmer	10 6	7 9	9 3
Winter Strawberry ..	10 0	10 0	10 0
PEARS.			
Beurré Claigeau ..	7 9	2 9	4 8
Beurré Bosc	2 0	2 0	2 0
Josephine	17 0	17 0	17 0
L'Inconnue	17 0	17 0	17 0
Winter Nelis	20 0	20 0	20 0

Per *Westfalen* (Hamburg, Bremen and Antwerp) sailed 13th March, 1908.

Variety of Fruit.	Highest Price. s. d.	Lowest Price. s. d.	Average Price. s. d.
APPLES.			
Adam's Pearmain ..	8 6	8 6	8 6
Ben Davis	7 0	7 0	7 0
Cleopatra	11 9	8 9	10 4
Five Crown	9 0	9 0	9 0
Garibaldi	12 3	8 9	10 2
Jonathan	15 0	8 0	12 1
Munroe's Favourite ..	15 9	7 0	8 10
Sturmer Pippin ..	5 6	5 6	5 6
PEARS			
Bergamot	7 9	7 9	7 9
Broom Park	7 9	7 9	7 9

Per *Bremen* (Antwerp and Germany), sailed 23rd March, 1908.

Variety of Fruit.	Highest Price. s. d.	Lowest Price. s. d.	Average Price. s. d.
APPLES.			
Adam's Pearmain ..	8 0	8 0	8 0
Cleopatra	12 6	8 9	10 2
Dumelow Seedling ..	9 3	8 6	8 11
Esopus Spitzenburg ..	12 3	6 0	9 9
Jonathan	14 3	7 0	11 4
London Pippin ..	13 3	7 0	10 0
Munroe's Favourite ..	13 3	7 6	9 8
Pomme de Niege ..	5 6	5 6	5 6
Reinette de Canada ..	6 0	6 0	6 0
Rome Beauty	11 9	6 0	9 0
Rymer	9 0	7 9	8 2
Statesman	7 9	6 6	7 6
Stone Pippin	6 6	6 6	6 6
Strawberry Pippin ..	7 0	6 3	6 5

apple as each differs so much in size and general appearance. If a general standard were fixed, however, this question might be left to the decision of the inspecting officer. The contention raised that too many small lines are sent, thus causing a multiplicity of brands, seems to be a sound and reasonable one, and is another argument in favour of co-operative, or, at least, united action on the part of the exporters.

A deal of harm has undoubtedly been done to the trade, especially in Germany, by certain of the States permitting the marking of diseased apples as such. This practice has not been carried out in any instance in this State; but where consignments have been found unfit for export the exporter has been prevented from sending them away as he has been compelled to adhere to the declaration embodied in the "Notice of Intention" to ship goods which he must forward to the inspector prior to shipment of such goods. This declaration sets out that the goods are sound. Under the Commerce Act Regulations "soundness" in relation to fruit means freedom from disease and the exporter renders himself liable to be proceeded against under the provisions of the Customs and Commerce Act if he presents diseased fruit for examination.

A list of the prices obtained for different varieties of apples and pears during various periods of the season is published on the opposite page.

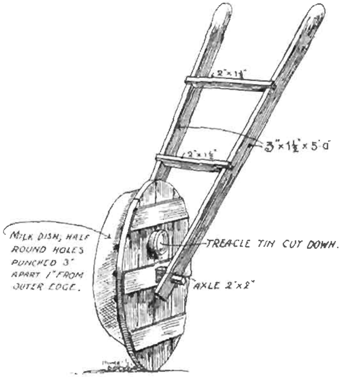
Those boats which sailed almost at the same time for the English and Continental ports have been selected as affording a comparison of the prices ruling in the different markets during the same period. In season 1907 the prices obtained in Germany were in advance of those obtained in Great Britain (*vide Journal*, December, 1907, page 745). This year, however, there was no marked difference between the two markets, but the prices which ruled in both are much below the average prices obtained last year.

The most striking feature in these lists, and one which would arrest the attention of even a casual observer, is the wide variety of apples shipped by each boat, especially by those boats which sailed in the earlier portion of the season. This, as the figures themselves show, is a mistake, because it will be noticed that a few of the better-known favourite varieties almost always command the highest prices. This seems to indicate that the growing of varieties for export should be made a specialty.

It would appear, after careful consideration of all the circumstances connected with the matter of last year's failure, that the exporters have a "hard row to hoe" before the trade can be established on a satisfactory footing. We have the example of America before us, however, to show that this is possible. As has been pointed out in previous issues of this *Journal*, there are so many factors having a direct influence on the problem of establishing our fruit export trade on a satisfactory basis that nothing short of combined sustained and determined action on the part of the growers and exporters will afford a solution. One thing seems certain, help can only come from themselves as nothing can be expected in the way of assistance from either brokers, agents or dealers at the other end

A HOME-MADE SEED DRILL.

A very useful home-made seed sower used at the Church Training Farm, Apollo Bay, is illustrated. It is used for sowing in drills seed such as maize, peas, beans, &c. Its construction is very simple, as it consists of a plain wheel, or the end of an old cask with an ordinary sized milk dish screwed on one side, with a square hole cut through both for a piece of wood 2 inches x 2 inches for an axle; half round holes should be punched



with a hollow tool about 3 inches apart 1 inch from the outer edge before the wheel is screwed on, leaving a lip to open and close to regulate the quantity of seed to be sown. A round hole large enough to take a 7lb. treacle tin should be cut about 1½ inches from the top and tacked in the hole for filling the sower. Two battens about 5 feet long with two cross pieces may be used for handles. The machine is wheeled along the furrow and sows very regularly.—W.H.D.

VINE CANES AS FODDER.

Vine canes, containing as they do, stores of reserve material such as starch and proteids to start the growth of the plant the following spring, constitute a fair fodder for stock. The food value is intermediate between that of straw and hay. The chief difficulty in connexion with their use is the amount of preparation necessary in the way of chaffing and crushing. When hay is cheap this militates against their use, but in seasons of scarcity they become valuable, especially for use in conjunction with other fodders.

In France they are largely used—special machines for treating them being obtainable. In certain French districts almost the whole of the vine prunings are utilized either for fodder or for bedding, especially in dry seasons. Sometimes the vines are pruned early—before all the leaves have fallen. The prunings, after chaffing and crushing, are then made into ensilage, in which form they constitute a valuable fodder.—F.C.

THE ELEMENTS OF ANIMAL PHYSIOLOGY.

(*Continued from page* 528).

W. A. Osborne, M.B., D.Sc., Professor of Physiology and Histology, Dean of the Faculty of Agriculture in the University of Melbourne.

XIII. Respiration.

No physiological activity is so obvious as that rhythm of movement which we call respiration or breathing. The necessity that exists for breathing is made up of a number of factors of which the following are the most important:—

1. The blood as it passes through the lungs takes up a supply of oxygen from the air and gives off some of its carbon-dioxide.
2. The flow of blood towards the heart in the larger veins is facilitated by the squeezing action on the abdomen, and the suction in the chest, which occur during inspiration.
3. In most animals, and particularly those that sweat little, the lungs can get rid of some superfluous heat.

The second and third factors have already been mentioned in previous chapters; the first and most important action will be considered in this chapter.

THE PHYSICAL FEATURES OF RESPIRATION.

Air, which is destined to enter the lungs, enters by the nostrils and then through the nasal passages into the pharynx. In yawning or violent breathing air may be admitted by the mouth. From the PHARYNX the air passes through a narrow opening called the GLOTTIS into the LARYNX which latter may be looked upon as the first portion of the wind-pipe. The aperture of the glottis is controllable; it can be completely shut or widened by means of special muscles. The TRACHEA or wind-pipe is a tube kept permanently open by means of incomplete rings of cartilage. The trachea as it enters the thorax divides into two BRONCHI, one for each lung, and these bronchi divide and sub-divide until an immense number of BRONCHIOLES are formed like the twigs on a tree. Each bronchiole ends in a small air-chamber with pouches or alcoves, called AIR-CELLS, around all its sides. In the walls of these air-cells, and separated from the air only by a very thin lining sheet of flat cells, is a dense mesh-work of capillary vessels through which the blood, pumped from the right ventricle, is constantly flowing. Each lung can therefore be looked on as a complex bag sub-divided into a large number of compartments. Thanks to this sub-division the air, which is breathed in, can be brought into contact with an immensely greater number of capillaries than if the bag were a simple one.

The outer surface of each lung is lined by an air-tight sheet of fibrous tissue called PLEURA; the inner surface of the wall of the thorax is similarly lined. Now these pleural surfaces are practically in contact being separated only by a thin layer of lubricating fluid. The lungs are highly elastic, and, in no matter what position the thorax is, are always in a state of stretch. Thus if the chest wall is opened, as may occur through a wound, and air is admitted from outside, or if the lung and its lining of pleura be ruptured so that the air within can escape outwards, the lung on the

affected side will, by virtue of its elasticity, collapse, and air will collect between the pleural lining of the lung and that of the chest wall. The lungs it must be remembered contain no muscle so that they are incapable of spontaneous movement. Some of the lower air-breathers such as the frog inflate the lung by forcing air in through a muscular effort in the mouth, akin to swallowing. In all the higher vertebrates however, air is admitted by the device of enclosing the lungs in an air-tight box—the thorax—which latter can be altered in capacity through muscular effort

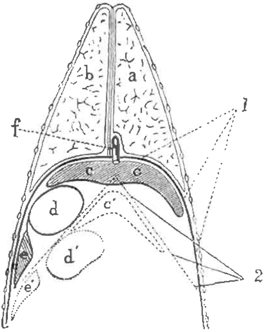


Fig. 54. Horizontal Section of the Horse's Chest, looked at from above, illustrating the Movements of the Diaphragm. (After *Sussdorf.*)

a, right lung; *b*, left lung. 1. Position of the diaphragm during deep expiration; *c*, liver *d*, stomach; *e*, spleen. 2. Position of diaphragm during deep inspiration; *c'*, liver; *d'*, stomach *e'*, spleen; *f*, posterior vena cava as it passes through the diaphragm.

When the thorax expands the surface of the lung follows the retreating thorax wall and so air is sucked in through the only inlet possible, namely, the trachea. The thorax can be expanded by two methods. Between the thorax and the abdomen is a dome-shaped sheet of muscle called the midriff or DIAPHRAGM. (Fig. 54). Within the dome are portions of the abdominal viscera, whilst in contact with the convex surface is the heart with a lung on either side. When the muscle, of which the midriff is largely composed, contracts, the dome is flattened particularly at the sides, and thus the thorax increases at the expense of the abdomen. The second method of expanding the thorax is by altering the position of the ribs. This is a complex movement not easily described and best understood by watching one of the larger animals, especially in laboured breathing. The ribs will be seen to move headwards and outwards, increasing the chest girth to a very appreciable extent. The reverse act, namely expiration, when it takes place in quiet breathing, does not demand any muscular effort; all that is required is that the muscular activities producing inspiration should cease. The abdominal contents being under pressure force the diaphragm towards the thorax. Further, the weight and the elasticity of the thorax and the elasticity of lung combine towards the same end, namely, the expulsion of some of the air-content of the lungs. But when

breathing is forced or laboured, then expiration must be facilitated and this is accomplished by the muscles of the abdominal wall contracting and therefore pressing the abdominal viscera against the diaphragm. Further, the ribs move in the reverse direction to that which takes place in inspiration and so the capacity of the thorax is reduced.

The amount of air which is taken in (or given out) in quiet breathing has been called "tidal" air but, as no definition of *quiet* breathing can be given, the term is valueless. The maximum volume of air which can be expired after the deepest inspiration possible, is called VITAL CAPACITY. The amount varies in man from 3 to 3.8* litres and is supposed to vary in a horse from 25 to 30 litres. After the most violent expiration there always remains a considerable volume of air in the lungs; this is called RESIDUAL AIR and its volume is given as 1.5 litres for man and 7 to 17 litres for a horse. Once air has been admitted to the lungs it cannot be completely got rid of by mechanical means; in consequence the lungs of a mammal, that has breathed only once, will float in water, whilst the lungs of one still-born, or killed before a breath has been taken, will sink in water.

THE CHEMISTRY OF RESPIRATION.

A clue to what is happening in the lungs is given by the chemical analysis of ordinary air as compared with that of expired air.

Air inspired.		Air expired.
Oxygen 20·9 per cent. ...	...	15·9 per cent.
Nitrogen and Argon 79 per cent.	...	79 per cent.
Carbon-Dioxide 0·04 per cent.	...	4·4 per cent.
Water vapour in varying amount	...	Saturated with water vapour.
Dust and bacteria present ...	...	No dust or bacteria.
		Traces of hydrogen and marsh gas present.

The loss of dust and bacteria is due to the trapping action of the moist surfaces of the breathing passages, particularly those in the nose, but all the other changes we may refer to the lungs. It is evident that oxygen is absorbed and an almost equal amount of carbon-dioxide added to the air. The traces of hydrogen and marsh gas are due to these substances being formed in the bowel by fermentation and being in part absorbed by the blood and liberated in the lungs. The nitrogen it will be observed undergoes no alteration. The main change concerns the oxygen and carbon-dioxide. Now it is found that if blood be placed under an air-pump, gases will escape in quantity sufficient to measure and analyze. The following table furnishes us with the next piece of evidence:—

The air-pump can extract from 100 volumes of blood—

Entering the lungs. (Venous.)		Leaving the lungs. (Arterial.)
Oxygen 6·5 vols. ...	..	12·8 vols.
Carbon-Dioxide 46·5 vols.	...	39·6 vols.

Plainly, therefore, the blood as it passes through the lungs takes up oxygen and gives off nearly an equal volume of carbon-dioxide. When we next consider how oxygen is held by the blood, we shall find that the hæmoglobin of the corpuscles is responsible for this faculty. If blood be bereft of its corpuscles and shaken with air, 100 volumes of the blood can

* A litre = 61 cubic inches = 1¾ pints.

only hold about half a volume of oxygen, but if the corpuscles are present, about 20 volumes of oxygen. Moreover, a solution of hæmoglobin will act in the same way. One very important character of hæmoglobin is that, if the oxygen of the air, with which it is in contact, be lowered from the normal 20.9 per cent. to 13 per cent., the deficit in the oxygen absorbed by the hæmoglobin is trifling; but if the oxygen be still further lowered in a series of equal gradations, then the deficit becomes larger and larger until small differences in the oxygen of the air mean large differences in the amount absorbed. There is nothing very remarkable in this behaviour of hæmoglobin. One can see much the same phenomenon in the absorption of carbon-dioxide by a solution of ordinary washing soda. But to the animal it has a profound significance. It means that the oxygen content of the air can be lowered (either by high altitudes or by dilution with nitrogen) and yet, within certain limits of course, the amount of oxygen absorbed by the blood is little altered. Thus an animal can live in an atmosphere in which a candle cannot burn, provided that poisonous gases are not present; and mountaineers frequently attain to-day to heights of 18,000 feet where the mass of oxygen per unit volume of air is reduced to one-half that at sea-level.

In the lungs the blood does not come into immediate contact with the air, but the oxygen of the latter can readily diffuse through the thin lining of the air-cells and through the capillary wall and into the blood. Through the same membranes the carbon-dioxide of the blood can diffuse outwards. The carbon-dioxide of the blood is held partly in simple solution, partly in the form of bicarbonates. It is also probable that the hæmoglobin can help in carrying some, but a small, portion.

The nitrogen in the blood is simply dissolved and plays no part in the animal economy. Mention must be made here of the poisonous action of carbon-monoxide, a gas which is produced by glowing charcoal and incomplete combustions such as occur when a flame plays on a metal surface, or when dust is roasted by contact with hot metal, &c. This gas has an extraordinary affinity for hæmoglobin and in concentrations of 1 volume per 1,000 volumes of air can oust the greater part of the oxygen from the hæmoglobin. Carbon-monoxide injures or kills not by any specific poisonous action but simply because of oxygen starvation.

INTERNAL RESPIRATION.

Every living cell in the body needs oxygen for combustion purposes either to furnish energy or to remove organic waste. When arterial blood reaches the thin-walled capillaries its oxygen can readily diffuse out into the lymph and so into the living cells where oxidation takes place. Now the chief products of cellular oxidation are water and carbon-dioxide both of which diffuse out of the cell into the blood. Hence arterial blood passing through the capillaries becomes venous, that is, loses some oxygen and gains almost as much carbon-dioxide. The more active the cell, the more oxygen does it require and the more carbon-dioxide does it pour out.

RESPIRATORY EXCHANGE.

The amount of oxygen absorbed, and conversely, of carbon-dioxide given out, varies within wide limits according to the size of the animal and to the

activity of oxidation in the animal's tissues. The following table gives an idea of the respiratory exchange in a state of rest of a number of animals for 24 hours :—

Animal.		Weight.		Oxygen absorbed.		Carbon-dioxide given out.
Horse	...	500 kg*	...	2,630 litres	...	2,530 litres
Boy	...	56 "	.	371 "	...	296 "
Sheep	...	50 "	...	360 "	...	327 "
Dog	...	30 "	...	252 "	...	205 "

But in the same animal the amounts may be greatly increased by exercise. Thus, a horse weighing 450kg. has been found to give the following figures :—

Oxygen absorbed per minute.						Carbon-dioxide given out per minute.
Rest	1·7 litres	...	...	...	1·6 litres
Ordinary work	15·7 "	...	...	. .	13·7 "
Heavy work	29·3 "	...	...	...	28 "

Further, when the animal is exposed to cold greater than can be combatted by cutting down the heat loss, the proper temperature is maintained by an increased oxidation in the body and thus again the respiratory exchange is increased. The respiratory exchange is also to some extent dependent on the amount of food. An increase in nutritive material absorbed is always accompanied by increased oxidation and production of carbon-dioxide.

THE REGULATION OF RESPIRATION.

The muscles concerned in respiration receive rhythmic impulses from their respective nerves which latter arise from the central nervous system and chiefly from the spinal cord. Thus if the *phrenic* nerve in the neck be cut, the diaphragm is thrown out of action and inspiration must be carried out by the thorax alone. It has been found by experimental investigation that a collection of nerve cells in the ***medulla oblongata*** is specially connected with the nerves to the respiratory muscles and is also in communication with a number of afferent or sensory paths and particularly those in the vagus (10th cranial) nerve. This collection of nerve cells is concerned with the regulation of respiration and it has been called the RESPIRATORY CENTRE. When these cells are excited, impulses pass down the appropriate nerves and the respiration increases in rate or depth or what is more common in both together and the ***ventilation*** of the lungs is hereby increased. The respiratory centre can be excited in a number of ways—

1. By carbon-dioxide brought by the blood. As has been shown the red blood leaving the lungs still contains carbon-dioxide and it has been found that this amount, when the animal is at rest, is just sufficient to excite the centre to produce quiet breathing. If a man takes several deep breaths then the breathing may be stopped for a longer period than could normally be borne. This condition is due to the fact that the deep breathing removes more carbon-dioxide than usual and not until this gas has mounted up to a certain concentration will the centre act. When an animal is vigorously exercised the breathing gets laboured. This again is

* kg = Kilogramme = 2·2 pounds.

largely due to the increase to the carbon-dioxide in the blood. We have here a beautiful automatic mechanism whereby the carbon-dioxide in arterial blood can be kept almost constant. Even a trifling rise in the carbon-dioxide content of the blood brings about a big increase in lung ventilation and in consequence the gas can be got rid of at a quicker rate.

2. Low oxygen content of the blood. If an animal breathes air containing less than 13 per cent. of oxygen the deficit in the blood excites the centre and respiration is quickened and deepened. Thus animals at an altitude of 12,000 feet and over display a marked increase in the amplitude of respiration. In strangulation the violent respiratory efforts which are made are produced not only by oxygen deficiency but by the heaping up of carbon-dioxide.

3. When the temperature of the blood rises above the normal the respiratory centre is excited, particularly in the non-sweating animals. The excitation, however, is never so intense as that due to either of the forementioned factors.

4. There is some evidence that in very violent exertion and in asphyxia such as occurs in strangulation, drowning, &c., the centre is excited, not only by carbon-dioxide excess and oxygen loss, but also by the entry into the blood of waste products from the muscles which would under normal conditions be oxidised.

The centre can be influenced by nervous channels as well, witness the limited voluntary control of the higher brain over the respiratory movements. Then there is also the action of the vagus to consider. When the lung is inflated and stretched the vagus sends up messages which stop further inspiration; when the lung is partly deflated, and the stretch somewhat relieved, the vagus sends up messages which start inspiration. The vagus mechanism is therefore for regulating the rhythm of the respiratory centre.

RESPIRATORY HYGIENE.

If the air be too dry the mucous membranes are liable to suffer, if too moist the temperature regulation of the body is impeded. Rarely does the oxygen of a badly ventilated house or stable or pen fall to an extent that would be harmful. But the carbon-dioxide of the air should not be allowed to mount up. In the case of the human being, house-ventilation aims at 0.06 per cent. as the maximum, and the same figure may be given for the domestic animals. When animals are herded too closely together in a building a number of harmful factors are produced. The air is rendered too moist and too warm; the carbon-dioxide is increased in percentage; poisonous gases voided from the intestine are breathed; moreover the warm moist air allows bacteria to grow luxuriantly on the *débris* of the body (sweat, shed cuticle, and, in the case of the lower animals, ordure) and so poisonous products of putrefaction are added to the air. The opportunity given to infectious diseases to spread where overcrowding exists is obvious.

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THE PROSPECTS OF AN EXPORT TRADE IN HONEY.*

Report by Mr. R. Beuhne.

I left Melbourne on March 26th, arriving in London May 5th, and after making preliminary arrangements for the collection of information, left for New York on May 9th arriving there May 16th. After visiting some of the prinicpal cities of the Eastern States as far west as Chicago, and interviewing a number of the most prominent apicultural experts, honey producers and dealers in honey, I returned to England on June 21st, and attended the congress of Franco-British beekeepers at the Exhibition on June 25th, as representative of Victoria. I interviewed the principal honey importers, dealers, and expert beekeepers of England, and visited some of the most up-to-date apiaries. On June 30th I left for Germany arriving at Hamburg the following day. I had interviews with members of the principal honey importing firms in Hamburg as well as with dealers and retailers in that city, Berlin, Dresden and smaller towns. I also visited the Government Institute of Apiculture at Erlangen in Bavaria, the well-known honey district known as the Luneburger Haide and beekeepers in other localities.

Prejudice Against the "Eucalyptus" Flavour.

The first point which I investigated was that of the alleged eucalyptus flavour so persistently urged as an objection against our honey. I submitted samples of the principal Victorian honeys to leading honey experts. importers, dealers, retailers, beekeepers and even casual acquaintances in the countries I visited, and without exception the opinions expressed were that the honeys tasted had a distinct and unusual flavour. Amongst my samples was one of scrub-honey and this was usually classed as the best, or the least objectionable, although in Victoria it ranks as inferior honey and is only periodically gathered by the bees in very limited quantities. I also carried with me samples of Jamaica honey and on occasions sub-

*Mr. R. Beuhne, President of the Victorian Apiarists' Association, and a leading authority on apiculture, was commissioned by the Minister of Agriculture to inquire into the prospects of establishing an export trade in Victorian honey, and report generally on apiculture as it is practised in the United Kingdom, Germany and the United States of America.

mitted this, with the Victorian honeys, both kinds being without labels or distinguishing marks. The Jamaica honey was preferred as being milder and more like European honey than ours is, while importers and dealers who had previously handled Australian honey had no difficulty in picking out the Victorian samples from amongst the Jamaican—in many instances by the sense of smell alone. Others who had had no previous experience of Australian honey objected to the strong and strange aroma.

At equal prices some of the importers indicated that they would be prepared to give Victorian honey some preference for manufacturing purposes on account of its greater density, provided regular supplies could be depended upon. When I pressed for a valuation, it was given as 2¼d. to 2½d. at port of arrival for the palest samples—Yellow Box and Red Gum—and somewhat less for others.

The opinion of those connected with the honey trade in London and Continental ports was that Victorian honey would in no way compete with the home product, but against honey imported from Jamaica, Chili and, in some seasons, from California.

A VICTORIAN APIARY—200 COLONIES OF BEES.

Consumers of table honey are very conservative in their tastes, and would rather pay more, or eat less, than take that which they are not accustomed to. This is more especially so in England. In Germany foreign honey is to some extent put up and sold for table use at about two-thirds the price of the honey of home production. The prices ruling for Jamaica and Chili honey in London and Hamburg at the time of my visit were from 20s. to 32s. per cwt. New Zealand honey which is gathered from clovers and non-eucalypts, realizes up to 45s., but comes forward only in limited quantities. It closely resembles English honey in flavour, colour and granulation.

Taking all these facts into consideration, it cannot be doubted any longer that the honey gathered from our eucalypts possesses a distinct flavour, not noticeable to Australians, who are used to it, but very evident to people in other countries. This flavour is not necessarily that of the essential oil of the eucalypt, and the term eucalyptus flavour does not imply more than a description of the characteristics of honey gathered from these trees.

It has been said that the prejudice against Australian honey arose from some one in England mixing eucalyptus oil with honey. This statement, which has been current in Australia for many years, was even referred to by the representative of one of the Australian States at the Congress of Franco-British Beekeepers and published in the press reports.

Whether eucalyptus oil was ever added to honey or not, or whether the rumour has hindered the introduction of Victorian honey in Europe, cannot be determined, but I am certain that it has been, to a great extent, the cause of honey producers in Victoria having failed so far to realize the true position of our industry in regard to oversea markets.

American Comments Favorable as Regards Density.

In America I submitted samples to the A. I. Root Company of Medina, Ohio, which is the largest manufacturer of beekeepers' supplies, and they are also dealers in honey, and are publishers of the well-known journal "Gleanings in Bee Culture." Necessarily they are thoroughly posted in every thing pertaining to apiculture. Mr. E. R. Root, and Mr. Warren, the honey salesman of the firm, commented favorably on the density of Victorian honey, which they considered very suitable for manufacturing purposes. I was informed that nearly two-thirds of the extracted honey produced in the United States is used for manufacturing purposes. Biscuit manufacturers and baking companies use enormous quantities of honey, principally the darker kinds, such as buckwheat. They buy by the car load or even by train loads. Honey is used in the United States much more extensively and for a greater variety of industrial purposes than it appears to be in Victoria. For table use my samples were pronounced to be somewhat strong.

At Marengo, Ill., which is 60 miles west of Chicago, I called on Dr. C. C. Miller, an authority on honey and probably the best known authority in apicultural matters in the world. His opinion on the samples submitted coincides with that of Messrs. Root and Warren. At Washington, D.C., I visited the Federal Department of Agriculture. Dr. E. F. Phillips, who is in charge of apiculture, was much interested in the samples of honey on account of their density. I left some large samples with him for investigation and comparison with other honeys, and I expect in due course to receive reports of the results.

Pessimistic Views of London Dealers.

Messrs. Trengrouse and Co., of Tooley-street, London. E.C., have, on several occasions, handled consignments of Victorian honey. They found the transactions unsatisfactory both to shippers and to themselves. They consider our honey unsuitable for table purposes under present conditions, and that the prices obtainable for manufacturing purposes are too low to satisfy producers in Victoria, in consequence of the competition of West Indian and South American importations.

At the request of Mr. Taverner I called on Messrs. Cosmelli, Meyer and Co., of East-Cheap, London, who had previously reported rather favorably on the prospects of an export trade in Victorian honey. During a lengthy interview and discussion of the merits of Victorian honey and the prices obtainable, Messrs. Cosmelli, Meyer and Co. sought to impress upon me the necessity of forwarding to London only honey free from the eucalyptus and tallow flavour, to which they had directed attention some time ago in a communication to the Department. I pointed out that variability in aroma is due to the simultaneous blooming of

different species of trees, during certain seasons, and consequently the character of the honey as regards aroma was quite beyond the control of the beekeeper; that honey, even from the same source, varies in colour and aroma in different years—a heavy honey flow, that is, a plentiful secretion of nectar in the blossoms, producing a milder and lighter coloured honey, probably due to smaller percentage of essential oils and colouring matter; that artificial bee pasture is altogether impracticable and therefore honey of a certain kind cannot be produced to order. A market for the honey from our natural flora had therefore to be found.

Messrs. A. Bredenberg and Co., of Monument Buildings, held out no hope of our honey ever getting as table honey a footing on the English market at anything like the price now obtainable for English honey. For manufacturing purposes large supplies of Jamaica and South American are nearly always available and prices are kept low by the cheapness of sugar. They considered the honey too strong for table use. They do a large business in Jamaica honey with prices, at the time, ranging from 20s. per cwt. for dark up to 32s. for fine set white. The latter would pass as European. Australian honey was then offering at 28s. in 1 cwt. cases containing two tins each. I obtained a sample of it and found it to be first-class from our point of view, and evidently a natural blend of Red Gum and Yellow Box honey.

Brighter Prospects in Germany.

At Hamburg I called on several firms of honey importers. Mr. Schwiecker, of Neuerwall, said the honey had too pronounced a flavour for table use. For manufacturing it would have to compete against other foreign honeys. He would have liked me to quote prices and state quantities that could be shipped, but owing to advices received since I left Victoria I could not do so. Mr. Basedow of Astheimer and Co., 2 Rolandsbrücke, at once detected the Australian aromas in the samples and objected to it for table use. Mr. Hauschild, of 16 Alsterdamm, is a recognised honey expert; his opinion was identically the same as that expressed by others consulted previously. He valued the samples at 15s. to 16s. per 50 kilo (100 pounds). A number of retailers of honey in different towns were approached. Some expressed the opinion that, though the honey submitted was rather strong, if regular supplies were guaranteed and it could be sold at prices below those of home-produced honey a trade could be built up with a class of consumers at present using little or no honey on account of high prices.

How Markets may be Created.

Several people whom I met and others I heard of, who had eaten Australian honey for some time had acquired a taste for it and did not then notice any peculiar flavour. The honey had either been presented to them by friends in Australia, or it had been bought, the purchasers being unaware of its origin. A continuous use had educated them to a taste for it.

I am of opinion that if suitable means were adopted of introducing our honey and a continuous supply maintained, a market, at prices satisfactory to the producer, could be obtained. Importers and dealers are at present disinclined to make special efforts on our behalf owing to the smallness of supplies, and their uncertain arrival.

Amongst a section of Victorian honey producers a belief exists that there is a ring of brokers in London and that honey from Victoria is sold

at low prices, and afterwards retailed as English honey at high prices. Special inquiries which I made convinced me that there is no foundation whatever for this belief.

There appear to me to be two ways in which an export trade in honey may be established: (1) A continuous supply or, (2) honey without the characteristic aroma. As to the first, to enable a continuous supply to be maintained in order to educate consumers to a taste for our honey, increased production becomes a necessity. The beekeeping industry in Victoria is just now at a stage when rather too much is produced in normal seasons for local consumption, but not enough for export. A step forward is the only means of ending the difficulty. Increased production may temporarily lower prices, but other industries, such as dairying and fruitgrowing have faced and overcome the same difficulty. In our own industry the removal of certain disabilities, and the adoption more generally by the majority of the best methods of management, would partly if not wholly compensate for the difference. As to the second, honey without strong aroma could be exported whenever production exceeds local consumption and would compete on even terms in European markets with honey from other countries. At present we have such honey obtained from minor sources only in very limited quantities. The cultivation of special plants for honey production is admittedly so impracticable as to deserve no further notice. It therefore remains to be seen whether the elimination of the strong aroma of our honey is possible, and commercially practicable. There is no doubt that much of it disappears after a time. The samples I carried which had been opened so many times were much milder in the end. Mr. W. F. Reid, of Fieldside Addlestone, England, a prominent member of the British Beekeepers' Association, expressed the opinion that the strong aroma could be effectually and inexpensively removed, without keeping the honey for the length of time which might be necessary otherwise. The removal of the objectionable aroma would in a great measure overcome the difficulties of opening an export trade and I think experiments highly desirable.

Methods of Marketing Abroad.

The methods of marketing in England, Germany and America are very similar. For the retail trade honey is universally put up in glass jars holding 1 lb. or ½ lb. I saw no honey put up in tin anywhere. One reason is that glass permits the purchaser to judge by appearance the nature, colour and condition of the honey. Most of the honey I saw was granulated, almost white and smooth resembling soft butter in texture. Tin packages are objected to on account of corrosion by the acids in honey, in the presence of moisture absorbed from the atmosphere, discolouring the honey. Most retailers insist on selling honey under their own labels, and doing their own bottling. In some cases packages bear the label of a beekeepers' association; in that case the retailer is usually the sole agent in his locality. The obvious object in either case is to advertise their place of business. An allowance is made for jars returned empty and this gives the dealer bottling his own honey an advantage over a rival buying and selling ready bottled honey. One pound honey jars with screw top caps and cork wads cost 15s. per gross in England; in Germany slightly less. The same kind would cost 22s. to 24s. in Melbourne.

SHIPPING VICTORIAN HONEY IN BULK.

Taking into account the extra cost in Victoria of jars, labour, and packing cases as compared with that in Europe, the greater risk of damage and loss, and higher freight on honey sent from here in glass as compared with bulk, and the unsatisfactory appearance of the honey on arrival, shipping in retail packages reduces the returns too much. For shipping in bulk the ordinary 60-lb. honey tin, or rather the same tin with only 56 lbs. in it would be the most suitable. The cases containing two tins each should have a division, as in a fruit-case, to strengthen the sides, which should be of somewhat stouter material than used for kerosene cases. Around each end of the case a thin iron band should be nailed to prevent the heads from splitting or the bottoms from being forced out by the weight of the tins. Instead of lever tops or soldering down, a screw cap soldered on after the tin is filled and with a disc of very thin tin inserted between the cap and the tin would be

AN OUT APIARY OF 100 COLONIES.

preferable. In this way the tin is hermetically sealed till it reaches its destination. On sampling the cap is unscrewed and the disc cut through. The cap can then be screwed on again to keep out dust, &c. A package similar to this, is in general use in America.

Honey from Jamaica and other places, intended for manufacturing purposes, is shipped in barrels which hold 2 cwt. or more. This style of package is recommended by importers for darker grades of Victorian honey. There is, however, a considerable difference in the price of barrels, and the nature of the wood used in their construction. As barrels leak through the pores of the wood if not waxed inside, this kind of package does not seem suitable for our requirements.

If it is intended to place honey upon European markets in retail glass packages it should be forwarded from here in bulk and the bottling and labelling arranged to be done at its destination.

DISABILITIES UNDER WHICH VICTORIAN APIARISTS SUFFER.

A number of Victorian apiarists are well advanced and could perhaps learn but little from those of their calling in other countries. There is, however, some room for improvement in knowledge, methods and enterprise in the case of a majority of the rank and file. This is due not to unwillingness or want of effort but rather to the absence of means of acquiring knowledge and proficiency by other means than their own experience. Even those foremost in beekeeping are handicapped through encountering difficulties peculiar to Australia and in the efforts to overcome them they cannot look for aid to the literature and experience of other countries. They are struggling, unaided by science, to solve problems not presenting themselves elsewhere. Knowing that our natural honey resources are not excelled anywhere they have faith in the future of the industry. During certain years great losses of bees occur from causes other than diseases or famine, and a decline in the production of honey in the succeeding years follows in consequence.

The removal of these disabilities would increase and cheapen production which would give an impetus to the development of an export trade.

With a view of gaining some further information on this subject I visited two apiaries at Raven in Northern Germany. Mr. F. Hedder has a stand of 120 colonies in straw skeps right in the township of Raven. The skeps are much larger than those used in England. They stand in two tiers under four sheds, forming the sides of a square with the bees flying to the inside. Mr. Hedder stated that his stock number of colonies is sixty, that is to say, he winters about that number every year. The increase obtained by swarming is 60 to 100 stocks. When the honey flow from the heather is over the bees in the skeps containing the new swarms are killed by sulphuring and the honey sold in the comb. The old skeps from which the swarms had issued are retained as stock for the following season. This practice, although it may appear cruel, has the advantage of leaving a young queen, and summer gathered stores in the stock colonies, while the heather honey in new combs obtained from the sulphured swarms is more marketable. Mr. Hedder said that frame hives had been tried but had not been a success. The heather honey cannot be removed from the combs by means of the extractor, being too dense. Tiering up, as is done in frame hives, has the tendency to leave the brood chamber practically empty of honey at the end of summer. When the heather blooms the bees fill the brood chamber with heather honey. This results in bad wintering of the colonies. The owner of another apiary some few miles out of Raven practises the same system as Mr. Hedder, and stated that years of experience had proved it to be the only practical method in that district.

If experiments were undertaken in Victoria to determine whether our winter and spring losses are due to the same causes, a means of avoiding them may be found in the changing of stores at the end of the season. This would prevent the loss of many stocks and the decrease in the yield of honey in the following season.

INSTRUCTION IN APICULTURE.

In the United States the Department of Agriculture issues literature on Practical Beekeeping, bee diseases, and the results of the investigations and experiments carried out under its direction. In states having laws relating to bee diseases inspectors under these Acts give instruction

in the treatment of diseases. In England the work of instruction and inspection of apiaries is under the direction of the British Beekeepers' Association, and has resulted in considerable progress of the industry. In Germany, travelling instructors give theoretical instruction and practical demonstration. Experimental stations carry out the work of research and experiments, and information is freely given whether asked for by letter or by personal application. The facilities offered for obtaining reliable information, and acquiring knowledge on the subject generally are of great advantage to the individual as well as to the industry as a whole.

BEE DISEASES.

Legislation in connexion with bee diseases is in operation in twelve of the States of America.

Foul Brood.

Of all bee diseases, foul brood, is considered the most formidable in Europe and America. Although not feared to the same extent in Victoria it is responsible for considerable losses in some districts. This disease is at present being thoroughly investigated by the Entomological Branch of the Department of Agriculture at Washington. Dr. E. F. Phillips states that the investigation which is still proceeding, has already revealed the existence of two diseases both till now known as foul brood (bacillus alvei). Two bacilli were isolated, the new bacillus being called bacillus larvæ, and the disease American foul brood; while that of bacillus alvei is now named European foul brood. The latter differs from the former in that it is more infectious, and spreads more rapidly, but will sometimes disappear of its own accord, a thing not known in a case of genuine American foul brood.

Dr. Phillips, having in a journal expressed a wish to investigate samples of foul brood from Australia I had taken specimens of diseased combs with me. Owing to the omission of a thorough drying before hermetically sealing the jars the specimens had become mouldy and useless. I promised to supply fresh specimens, properly prepared, as soon as available. In England both diseases are still held to be two forms of one disease, as shown by the utterances of speakers at the Franco-British Congress.

Bee Paralysis.

Bee Paralysis, a disease very destructive in some of the best honey districts of Victoria, and well known also in the United States, has, up to a certain point, been investigated at Washington. Dr. Phillips states that no definite results have been obtained so far, nor has it been proved that the disease has a bacterium. The presence of bacilli shown by the microscope does not prove them to be either the cause or the result of the disease. The investigation into bee paralysis will be further pursued when that of foul brood is completed. The majority of American beekeepers are of opinion that paralysis is a constitutional disease, and that the predisposition to it may by selection be bred out. Mr. T. W. Cowan, the well-known English authority, holds the same view in regard to foul brood, namely, that by breeding from stock which remained free from disease although surrounded by it, a race of bee practically immune could in time be produced.

Dysentery.

Dysentery, one of the troubles experienced in spring, and much more prevalent than is generally known, is often mistaken for paralysis which it resembles in some of its symptoms. The cause of dysentery appears to be the consumption, during periods of comparative inactivity, of stores with a high percentage of nitrogenous matter. In America it was for some years a practice with a number of beekeepers to winter their bees on combs of sugar syrup, but this method has since been abandoned as too troublesome. The ailment disappears when warmer weather enables bees to fly regularly, but it often leaves colonies very weak and nearly useless for the season.

Mr. Karl Hofmann, of the Government Institute for Apiculture at Erlangen, assured me that, given the proper kind of stores for winter and early spring use, he would guarantee to bring every colony through successfully. While a high percentage of albumen in honey is very useful during the breeding season, owing to its stimulating action, it is on that very account that it is detrimental in winter. Mr. Hofmann made tests of some of the honeys I had with me, as well as tests of German honey. Red box honey showed a very small precipitate of albumen; grey box a rather heavy one. German heather honey gave a very heavy precipitate. This honey is considered quite unsuitable for use in winter by the bees. Some of it was in the comb, partly granulated in coarse grains with a clear liquid remaining. In Victoria I have often seen this kind of granulation before, usually in hives which wintered badly.

THE EXPORT APPLE TRADE TO GERMANY.

Comments by a Hamburg Firm.

Australian apples, hardly known in Germany ten years ago, have gained such favour with the general public that the consumption is rapidly increasing each year. This is evidenced by the increased imports of Victorian, Tasmanian, and South Australian fruit. In 1906, 37,961 boxes were taken; this year the number was 55,847 boxes, an increase of over 50 per cent. within two years. Messrs. Ph. Astheimer and Sohn, fruit brokers, Hamburg, report having experienced an active demand; most of their buyers having by the middle of July cleared their purchases satisfactorily. They add that the good results will encourage the purchase of larger quantities next year.

Unsatisfactory Victorian Shipments.

While it is said that the fruit from Tasmania gave more satisfaction than in previous years, and that the quality of certain varieties of South Australian apples gave full satisfaction Victorian shipments are unfavorably commented upon. "The fruit from Victoria was on the average not as good as in former years, and sales of a good many shipments were not satisfactory. The quality could not in most instances be compared with South Australian or Tasmanian apples, and on account of the short crop the shipments mostly consisted of small lots, which did not attract the attention of buyers. A few shipments were of fine quality and could match those from other States, and such lots could be easily disposed of."

Advice as to Grading and Packing.

Grading was generally satisfactory, but in some instances, apples of different sizes were mixed. Strong stress is laid upon the necessity to grade with the utmost care, as German buyers have naturally more confidence in such lots as show all fruit of same size than in others with different sized fruit. The circular suggests the following grades:—A. for large, A.A. for medium, and A.A.A. for small fruit. Special fruit might be marked "Special," but only in case the fruit really merits this grading. It is stated that it is of no use whatever to pack two or three boxes of special fruit, as only lots of some 10 to 20 boxes or more will yield satisfactory results.

The use of more wood-wool—which should be clean, dustless, and without smell—is advised in some cases, as during the voyage the apples shrink to some extent; if they are not packed firmly, they are liable to be badly bruised.

Shippers are advised to send bigger lots, of at least 20 boxes of each grade and variety, as they always have a better chance. If lots are too small the leading buyers pay little attention to them, owing to the time required to inspect so many samples. It is remarked that growers may not always be in a position to pack large lots; in such cases it is suggested that neighbours should combine, and put fruit of even grade under one brand.

Broken Packing Cases.

The attention of Victorian shippers is directed to the more or less broken condition in which many cases arrive, especially when transhipped *viâ* London. This is attributed to the nails in the case working loose. To avoid this the nails should be put into salt water or vinegar, which will cause the nails to grow rusty when in the wood, which makes them hold better. This expedient is adopted in Spain and Italy. Rusty nails are mostly used in Tasmania where the green hardwood is much harder than the Victorian.

Future Prospects of the German Market.

It is admitted that prices have not been up to expectations this year. For really first-class fruit, prices always were satisfactory, medium qualities returned comparatively fair prices, but low prices only could be obtained for inferior apples.

"Our market has been influenced very much by the London market where low prices were ruling nearly all the time. Hamburg is the right market for the very best qualities of apples, which are sure to get higher prices here than in any other market. For second-class and inferior stuff, Hamburg cannot afford to pay better prices than English markets do."

Note.—Mr. J. G. Turner, Senior Inspector, Fruit Exports and Imports, states that the shortage from Victoria was so great that there was very little prime fruit to fill space which had been booked weeks ahead; hence growers were compelled to send the best of a generally poor lot. Inspectors have no power to refuse shipments of such fruit unless diseased or incorrectly described.

Mr. Turner also states that the advice as to the use of wood-wool should be accepted with caution. The over generous use of this material often leads to complaints that the case contains a short measure of fruit—caused by the wood-wool taking up too much space. Cases containing less than a full bushel of fruit are liable to rejection and seizure for false description.—Editor.

MERINO RAMS.

(*Continued from page 503*).

H. W. Ham, Sheep Expert.

Two-tooth rams cannot be selected for wool points, with a certainty of every individual sheep coming up to the standard again at four-tooth, although with long experience and close observation, one can come reasonably close to doing so. Very often a two-tooth ram may have met with fortunate circumstances, such as being born in a favorable autumn, and consequently been well reared; he may meet a favorable time for weaning in the following spring and summer, and with the autumn again good, he could, on strong healthy pasture, be a light fore-quartered ram and yet be well grown and nicely woolled. But often from two to four-tooth a ram of better constitutional shape will keep on improving, while the light forequartered sheep fails, or at best only maintains his qualities. In all breeds this is one of the main reasons for promising two-tooths not turning out up to expectations at four and six-tooth. If the choice lay between tall light forequartered rams grown under favorable circumstances in healtby country, and shapely lesser well-grown rams, not under sized, from second-rate pasture, all fleece conditions being about equal, the latter class is preferable, and if continued with, gives better results in the end anywhere.

Ram lambs are difficult to grow well up to "two-tooths." Although ewe weaners are checked in many cases with fly-blow, in-growing eye-lashes, wool-blindness, ophthalmia, scald, etc., they thrive and look better than the same age ram weaners. Ram lambs have to be taken from the ewes at an earlier age than ewe lambs. This is the chief reason of their backwardness as compared with ewes at the same age; but added to this, at about weaning time, when they are about five months old, the development of their sexual organs commences, and horns grow very fast, and continue doing so right on through the winter. This, with the growth of the fleece, all requires maintenance. In late winter the loss of their lamb's teeth commences, and they become practically broken-mouthed. A broken-mouthed weaner is for a time worse off than an old sheep. Very often they are found with the gums bleeding, especially at the stage when the lamb's teeth are breaking out, and the new teeth coming through. All things considered, they have a harder time than the ewe weaners.

Ram lambs can beget occasional lambs at about five months old, and while it is desirable to keep them as long as possible on the mother's milk care has to be taken to prevent them from getting some of the ewes in lamb. It is difficult to know exactly when a ram lamb should come away. Size is not always a true guide; lambs are dropped during six to eight weeks, and there is then often two months difference in the ages when weaning time comes. It is a good plan to take ram lambs away fortnightly or thereabouts. One guide is growth of horn, but a better method is to run them past along the forcing pen fence, only a few at a time. A fair idea of age can then be obtained by noting size, growth of horn, etc. If allowed to stand a few seconds, the oldest will be seen to lower the testicles down well into the purse, and when made to run they will draw them up smartly. When they can lower the testicles well down they should come away; any doubtful ones must be handled. A ram lamb that cannot lower his testicles is impotent, and an old ram that cannot raise them is the same.

(*To be continued*).

COW-PEAS.

Lieut.-Col. J. R. Y. Goldstein.

Departmental experience with cow-peas has shown them to be a most precarious crop under ordinary field conditions. They are most sensitive to late frosts, and even a cold day checks them severely. As a commercial crop, they are not held in high estimation, although for green manure or fodder they are of great value. Under irrigation in the Goulburn Valley excellent crops have been grown.

Last season, varieties were supplied to Lieut.-Col. J. R. Y. Goldstein, who undertook to test them at the Cheltenham Convalescent Home for Men. Considering the nature of the soil and the unwonted dryness of the season, the results, as given in the following report, are of value:—

It will be remembered that the winter of 1907 was so dry that the subsoil was deprived of its annual wetting. Consequently, spring and summer growth was unusually backward, and was further injured by the absence of summer rains. The cow-peas, sown late, suffered like other vegetation, and there were many gaps in the lines. But, being drought-resistant, the bulk of them came through the dry season satisfactorily.

The four varieties supplied were, New Era, Iron, Wonderful, and Whip-poor-Will. The parcel of Iron contained peas of two colours, though evidently true to name; these I separated and sowed in distinct plots to test for any difference, naming them provisionally, "White Iron," and "Red Iron." The result showed the dark to be a fortnight later than the light pea, but the difference may have been accidental and will be tested further. All the peas were sown on 18th October, and they ripened seed in the following order:—

White Iron	...	15 Feb., 1908	...	106 days.
New Era	...	21 Feb., 1908	...	112 days.
Red Iron	...	24 Feb., 1908	...	115 days.
Wonderful	...	28 Feb., 1908	...	119 days.
Whip-poor-Will	...	19 Mar., 1908	...	139 days.

All continued to produce pods until 16th April, when they were ploughed in by mistake, but previous experience in Gippsland goes to show that cow-peas will produce pods until stopped by cold. The pods were gathered weekly and careful records kept. The heaviest gatherings were obtained during the third and fourth weeks in March and the first week in April.

White Iron and Red Iron are similar in growth and yield, plants about 20 inches high, ripening seed early, and bearing pods in succession for about three months; pods about 7 inches long, containing 12 to 16 seeds of medium size. Imported seeds are deep brown in colour, some being cream-coloured.

New Era, the second earliest, is a low-growing, slender bush with delicate foliage, small pods and seeds; pods about 6 inches long, thin, containing 12 to 16 seeds, brown in colour and mottled.

Wonderful, third in order of ripening, has robust and spreading growth, with strong branches and large leaves, covering the ground quickly; plants about 14 inches high; pods about 8 inches long, thick, containing 12 to 18 medium-sized peas, flattened at the ends, colour reddish brown.

Whip-poor-Will, a late variety, is strong in growth, with an abundance of large foliage; branches spreading and numerous; height about 18

inches; pods about 9 inches long, fleshy, containing 12 to 18 large peas, kidneyshaped, brown mottled.

A Strong Plea for Their Culture.

Cow-pea plants grow vigorously until they commence bearing, then slowly until April, when they start a second growth, throwing out branches with a running habit, soon forming a densely-matted mass of rich, succulent herbage suitable for fodder, ensilage, or green manure. The plants are specially suitable for making into stack ensilage, which may be done in the paddock where grown, thus reducing labour, bringing ensilage-making within the scope of any small farmer, and thereby inducing that class to adopt the making of ensilage regularly. When ploughed under, for green manure, the soft, sappy mass rots very quickly, so that any other crop may be sown almost immediately. It is this quality, of speedily breaking up in the soil, due to the luxuriance of its second growth, which constitutes much of the value of cow-peas for manurial purposes. It has been claimed for this plant that, under favorable conditions, two sowings

COW PEAS.

can be grown successively in one season, which further heightens its value for restoring humus to hungry and worn-out soils. It also gives a heavy dressing of nitrogen to the soil, which benefits the following crop, and even when the plants have been cut for fodder, the remainder, when ploughed under, is much more useful than the dry stubble of any other crop. Cow-peas should be sown as early in spring as possible, but where there is danger from hard frosts, sowings may be delayed until later. They

will flourish in all parts of Victoria, from the Murray to the sea, and will succeed in the poorest soils and the driest seasons. In rich soils, they should be sown 2 feet apart in the row, rows 3 feet apart. In ordinary soils, the plants may be closer in the row, say 18 inches apart; and in poor soils 12 inches in the row, and 30 inches between rows.

American farmers regard cow-peas with much favour and grow them largely for many uses, but green manure is the main purpose. American cattle and sheep thrive well upon the fodder, the plant being rich in albuminoids and carbohydrates. In the household, the green pods are found to be equal to French beans, while the dry peas are used to replace haricot beans for table use. Their long period of bearing—cow-peas podding freely for three or four months during the hottest summer—should commend this plant to our market-gardeners. For seed, cow-peas are very profitable, yielding from 20 to 40 bushels per acre. The retail price here, at present, is about 30s. per bushel, while field peas are about 4s. 6d., with a similar yield of seed. This great difference should give large profits to growers of cow-peas for some considerable time. But, even were the price to be reduced to that of ordinary peas, the cow-pea would still be the more profitable crop to grow; its superiority being manifest from its not drying up after its seed has been ripened, and by the value of the second crop of material for fodder or for manure; material, perhaps, of nearly equal money value to that obtained for its previous crop of seed. What greater inducements can Victorian farmers require to make them give cow-peas a trial?

Although this plant is called a pea, the seed is shaped like a bean. Botanically, it is closely allied to the Dolichos. It is described under the name of *Catiang Sinensis*, synonym *Vigna Sinensis*. It has been in use for food purposes for a thousand years or so; it is the Chowlee of India, the Tow Cok of China, the Caffre Bean of the Cape, and now, the Cow-pea of the United States. There are several varieties, with seeds varying widely in shape and colour, white, grey, brown, and black, with many intermediate shades and markings. It is one of those tropical plants, like maize, which grow well in cool climates and ripen their seeds freely.

I am not aware that any extended attention has been directed by scientists to changes of colour in seeds grown under varying conditions, but the changed colours under the present tests are too remarkable to be passed over. All peas produced from dark-brown and from reddish seed have come white; there is not one dark seed in the produce from either Iron or Wonderful. In New Era, the brown has disappeared, the produce showing a rather pleasing shade of grey; Whip-poor-Will, a dark seed, has produced buff-coloured peas. As it is the red colour which has vanished, the change may possibly be due to the absence of iron from the soil. Cheltenham soil is almost entirely composed of a silicious sand containing no iron; but, as most manures contain some iron, the disappearance of red from the colouring of all these peas, seems to me to indicate clearly the extreme poverty of the particular soil in which they were grown. It will be interesting to experiment this season with applications of iron sulphate in different proportions. At any rate, present results are so striking that they should be worth placing on record, not only because they show the impoverished condition of the soil, but also because they go to prove, incontestably, that cow-peas can be depended upon to produce fair crops in impoverished and poor soils, even in very dry summers. I propose to continue tests this year, adding three other varieties, and sowing a month earlier than last season.

CULTURE OF PERMANENT PASTURES.*

W. J. Colebatch, B.Sc., (Agr.), M.R.C.V.S., First Assistant Veterinary Officer.

In a recently published work on Grasses, the author has summarized his views on the management of permanent pastures in America in the following words:—"Except in comparatively few localities the American farmer has never learned the art of maintaining grass lands in a permanently productive condition. This is partly due to the character of the grasses grown and partly to the treatment accorded grass lands in this country." Probably it is not too much to say that the Victorian farmer is in very much the same unfortunate state of ignorance. Indeed I fear his position would compare unfavorably even with that of his American cousin. Throughout the greater part of the State the operation of grass seeding is almost entirely unknown, and even in good grass-growing districts, instead of the land being properly prepared and carefully laid down with selected grasses, it is allowed to "tumble down" into grass of such character and bulk as nature may direct. Grass, either in the form of hay or green fodder, is one of the most important products of the soil, and in many parts of this State it furnishes the only pabulum for stock throughout both winter and summer. It seems strange then that of all crops on the farm, this pre-eminently important one should be so greatly neglected by farmers.

The climatic conditions here are not such as to render the formation of permanent grass lands an easy problem; and, no doubt, consciousness of this fact has induced an all too-ready acceptance of failure as conclusive proof of the incompatibility of luxuriant permanent pasturage and Australian weather. The question that arises is:—Has any whole-hearted attempt even yet been made in Victoria, or for that matter in Australasia—to cope with the difficulties that surround this problem? In Victoria we have to deal with the improvement of existing pastures, and the establishment of new fields in districts where permanent grass lands already exist, and also in districts where reliance has hitherto been placed solely on the natural growth of the soil.

In this paper I do not propose to deal with the last problem, though I am firmly convinced that by paying attention to the selection of the best indigenous grasses, by more liberal treatment of the young growth, and by the introduction of plants that have proved invaluable under similar conditions in other parts of the world—Brome grass and Bermuda grass in the arid regions of America—a vast improvement may be brought about. I hope to have an opportunity to deal with this important aspect of the grass problems of Victoria on a subsequent occasion. For the present, however, I would invite attention to some of the chief points to be considered in the formation of good permanent grass fields, and the maintaining of the same in a highly productive condition. The subject matter may be divided into two parts:—

- (1) Formation of Pastures—
  - (*a*) Preparation and manuring of seed bed,
  - (*b*) Selection and sowing of seed.
- (2) Management—
  - (*a*) Of young grass,
  - (*b*) Of old pasture.

* Paper read at the Sixth Convention of the Victorian Chamber of Agriculture, held June, 1908, at Geelong.

Preparation of Seed Bed.

In fitting the soil for a crop that is to occupy land for a series of years, it is unquestionably sound practice to do the work thoroughly and well from start to finish. The chief desiderata are a well cleaned, firm, and mellow seed bed, fine tilth, and a high fertility potential. To obtain these under Victorian conditions, it will usually be necessary either to precede the grasses and clovers with a bare fallow, or else to preface them with a preparatory crop which will leave the soil in good heart and in fair working condition. A true fallow crop, such as maize or sorghum, which has been generously manured and subjected to continuous summer cultivation, would form an excellent preparation for pasture plants. The soil would not only be clean and in good heart, but, in addition, the succeeding grasses would benefit largely from the sub-soiling effects of the deep penetrating root systems of the preceding crop.

If the immediately preceding crop has been a shallow rooted plant, a 6 inch or 7 inch furrow should be turned as the initial operation in the preparation of the seed bed. The land should then be disced, harrowed and rolled again and again till the desired tilth is obtained. It will probably be found necessary to work obstinate patches an infinite number of times to effect this; but of such importance is this factor in the establishing of a good sward that it were better to delay grass seeding for a whole season rather than court disaster on an ill-prepared seed bed. When the preceding crop has been a good subsoiler, it may in some cases be sufficient to have the land thoroughly disced, and then worked down into a good tilthy seed bed, but it must be borne in mind that wherever the land has been persistently ploughed at about the same depth for a number of years, or where lime has been heavily or frequently applied an impermeable pan will most likely have formed, and this will need to be thoroughly broken up, either by deeper ploughing or by sub-soiling before a satisfactory sole of grass can be obtained.

Low-lying paddocks require to be pipe-drained, heavily dressed with caustic or water slaked lime, and thoroughly aerated by vigorous cultivation given at a time when the land is in "good season," that is, when it contains just sufficient moisture to work freely without tending to poach. Speaking generally in so far as the seed bed is concerned, the Victorian farmer may be said to have comparatively few difficulties to contend with, and if he can only be induced to view the preparation of the land for grass as seriously as he does the working of the grain and hay fields he will assuredly succeed in providing the desired conditions for a successful "strike" of grass.

Manuring of Seed Bed.

In order to insure a good germination and to secure the young growth against the effects of competition, frost, and drought, it is imperative that the well tilled surface soil be plentifully supplied with readily assimilable forms of plant food. In most soils it will pay to give a dressing of 5 to 10 cwts. of lime per acre after the first ploughing, and this should be supplemented by a mixed phosphatic and potassic manure. Probably the following dressing would yield good results in the recognised grass districts of Victoria:—

Thomas phosphate	2 cwt. per acre.
Kainit	2 cwt per acre.

This would give a fair average dressing for districts with a rainfall of 18 inches or over. In drier areas it would be wiser to substitute first grade superphosphate for the basic slag, and to reduce the quantity by one-half.

Selection of Seed.

In making up a permanent grass mixture, we are confronted with innumerable difficulties. No arbitrary rules can be laid down. Each particular variety of soil and climate requires to be experimentally tested before the optimum mixture can be ascertained. As Professor Spillman has remarked, it is easy enough to prescribe mixtures that *ought* to give prolific growth for the greater part of the year, but yet we find that little or no headway is being made. The reasons are that the mixtures are not adapted to suit all conditions; and again, the farmer is at fault for not giving the experiment a more extended trial.

Certain grasses affect very different habits of growth under modified climatic conditions: Poa pratensis or meadow poa grass, a constituent of most permanent grass lands at home, is at once the famous Kentucky Blue grass of America, and the dreaded "Black Twitch" of New Zealand, so that knowledge of local experiments must be first obtained before a judicious mixture can be compounded. The grasses may be divided into "top" and "bottom" plants according to the position they occupy in the sward. Those that develop into tall, strong-growing grasses, such as tall oat grass and cocksfoot, are known as "top grasses;" while the dwarf varieties, foxtail and sheep's fescue, form the sole or bottom herbage. In hay-growing mixtures, the former must predominate, but for pasturage tall medium and short varieties must be included.

Amongst the early flowering varieties may be mentioned meadow foxtail, perennial rye, smooth-stalked meadow grass, cocksfoot, white clover and trefoil. The mid-season group includes crested dog's tail, meadow fescue and red clover, whilst the late flowering species are timothy, lucerne and alsike. Timothy, meadow foxtail, and rough-stalked meadow grass are usually found on heavy clays and clay loams; on lighter soils cocksfoot, smooth-stalked meadow grass and fescue grasses, whilst rye grasses, crested dog's tail, and sweet vernal occur on all types of soil.

The two last-mentioned grasses yield a very small amount of feed, but form excellent sole grasses. Cocksfoot is rather apt to become tufty, but it provides fresh succulent shoots from early spring to the end of summer, and in good districts right on into the autumn. Timothy, on the other hand, spends all its energy in producing an early hay crop, and then lies practically dormant, there being little or no aftermath. Again, rough-stalked meadow grass comes early and late but appears to rest in mid-season. Another important point to be borne in mind in selecting seeds is the palatability of the plants; for example, golden oat grass is never touched except when very young and fresh. The dominant species are not always the most useful, as they may have been repeatedly avoided by grazing stock, and thus have gained the upper hand.

Amount of Seed.

A fairly heavy seeding on good land would be about 40 lbs. per acre, say 30 to 32 lbs. of true grasses and 8 to 10 lbs. clovers. It is wise to allow a liberal seeding, as renovating mixtures are rarely a big success;

and, after all, if you can establish a really good stand, the extra outlay will be returned a hundred-fold. In estimating the quantity to be sown, the real value of the seed must be computed—by this I mean the actual proportion of true seeds capable of germination. This can be readily ascertained by multiplying the purity per cent. by the per cent. of germination, and dividing the product by 100. We can then tell how many pounds we require to sow, but a good margin for loss must be allowed, especially in regard to small seeds, such as Timothy. Up to 50 per cent. is added in the case of small seeds to be sown on a rough bed or one which is not clean. In this connexion I desire to bring under notice some of the results obtained from tests made to ascertain the germinating capacity of grass and clover seeds on the Melbourne market this season. A hundred seeds of each species were used, and the experiments were made in triplicate. One sample of Hungarian forage yielded as low as 1 per cent. of germinating seeds, and a large number of others did not exceed 50 per cent. These I would specially mention:—Meadow fescue, 12 per cent.; strawberry clover, 16 per cent.; melilotus, 12 per cent.; crested dog's tail, 43 per cent.; lucerne, 52 per cent.; white clover, 64 per cent.; and perennial rye grass, 66 per cent. The fact that these figures do not represent the real values, but only the percentage of germinating seeds, must not be lost sight of, as the actual value of the commercial article may be considerably less than these figures indicate. To put the matter in a concrete form—if a sample of grass seed is found to contain 80 per cent. of pure seed which gives an 80 per cent. germination test, then the real value is reduced to 64 per cent., or in other words, only 64 lbs. out of every 100 sown is capable of contributing towards the formation of pasture. In carrying out the tests above referred to, it was found that some samples contained an inordinately high proportion of sluggish seeds, in many cases as much as 20 per cent. took an undue length of time to germinate. In the face of these facts it seems to me desirable that some effort should be made to supervise the importation of seeds with the view of preventing the introduction of weeds and plant diseases, and at the same time of raising the quality of our seeds by establishing standards of real value. A farmer may be quite capable of judging the general weight and quality of farm seeds, but he can never be expected to detect all forms of adulteration, or to estimate the percentage of seeds that will germinate.

Sowing the Seed.

We have next to consider a number of important points in regard to the operation of grass seeding. These may be grouped under three heads:—

(1) The time of the year to sow.
(2) The advisability of sowing a nurse crop.
(3) The method of sowing and covering the seed.

Season to Sow.—Grass seeds are sown in the spring and autumn, but so far as Victoria is concerned it is only in the southern regions that a choice exists, as the spring months are not sufficiently moist in the north to promote a rapid germination and to enable the young plants to get "their toes dug deep" into the land before the summer sets in. Even in the western and other favoured districts, spring sowing must be early enough to let the young plants develop vigorously before the weeds begin to flourish. Otherwise they will be choked right out, or at best will develop into such slender

weaklings that they will shrivel off on the first appearance of summer. Some species of plants are exceedingly tender while young, notably lucerne and clovers generally, and, consequently, where the winters are extreme, these should be held back till spring time, or if autumn sown they must be seeded very early so as to get well established before the winter frosts set in. In fine, it may be said early autumn sowing will give the best results in our climate, though in the south-western and south-eastern portions of the States early spring sowing, when conditions of soil and soil moisture are favorable, may be expected to yield equally good results. After all, in really good grass country, the preparation of the seed bed and the after-management of the field are much more potent factors in determining the success of the work than the season for seeding.

Sowing with a Nurse Crop.—The practice of sowing grass seed on a growing crop in the spring or of laying a paddock down to grass with a spring or early summer crop is one that appeals to all practical farmers, but to what extent this system of pasture formation may be safely advocated in this State it is impossible at present to say. Reasoning from American results, however, it is fairly easy to predict that failure, partial or complete, must result whenever it is tried under a light rainfall. The general concensus of opinion on this matter is that better results are to be obtained without the so-called nurse crop, and unless it is found to be quite impossible to do without the extra fodder, this practice should not be departed from when permanent pasture is being aimed at. It may be as well, perhaps, to set out the arguments pro. and con. on this somewhat controversial topic. The advocates of the cover crop system urge the following reasons for their views:—

(1) An extra crop is gained without materially affecting the virility and permanence of the grasses.

This may be true in the case of spring-sown grasses, as they will not yield any great quantity of feed till the following spring, but in the case of autumn-sown grass which has not been handicapped by an overtowering grain crop a substantial amount of fodder will be available in the summer months, whereas when grown with a nurse crop practically nothing will be returned till the second year.

(2) The growing crops furnish a protective covering to the tender young plants, thereby sheltering them from the injurious effects of the frosts.

By this it is meant not only the nipping back of the young growth by the direct influence of the frost, but also the soil movements induced by the frosts, whereby the seedlings are hoisted up out of their warm bed into the cold air.

(3) After harvest the stubble, if cut fairly high, continues to act the part of a "nurse" "cover" or protective crop to the oncoming grasses and clover.

Any of the cereals will serve the purpose, but wheat is generally preferred, as it allows more air and light to reach the soil, and then again it stands up better than oats or barley.

On the other hand, those who decry the cover crop system argue as follows:—

1. The over-growing crop takes a large amount of nutritive material out of the soil which should remain there for the benefit of the young grasses, and for this reason they prefer to call the growing cereal a "robber crop."

2. As against the suggestion that protection is afforded by the cover crop, they contend that when the crop has been harvested the slender young stubble plants that have hitherto been shaded and robbed of their food, and thereby weakened, are unable to bear up under the hot dry summer weather.

3. From the time of sowing till the cover crop is harvested nothing can be done to encourage the young grass to stool well and become robust.

To summarize, it would seem that from a scientific stand-point, valid reasons can be urged in support of both views, but it is now an established practical fact that, given suitable conditions of soil and climate, equally good swards can be provided under the shelter of a grain crop as without it; in fact, on the Canterbury Plains of New Zealand, grass paddocks are successfully laid down with such crops as turnips, swedes, rape and kale, all of which are fed down in the paddock with sheep and cattle. Such practices cannot be at present advocated in Victoria; indeed, at this juncture, I am unable to say that the institution of any form of nurse crop is *not* attended with a certain amount of risk, and, therefore, I am not disposed to advise their introduction, except in the case of land which is very difficult to clean; and in that case a light seeding of wheat or oats will have the effect of checking the weeds, and if cut for green feed or hay, it will not seriously affect the prospects of the young pasture.

METHOD OF SOWING AND COVERING.—This operation is of the utmost importance, as on it depends the net return to be derived from the expenditure of time, money, and labour in the selection of good seed, and the careful preparation of the firm tilthy seed bed. Unless the work is conscientiously carried out an uneven germination must result, and the field will remain patchy as long as it carries grass. Immediately prior to sowing the surface should be harrowed, and if need be, rolled and harrowed.

Several methods are adopted for the actual sowing of the seed. Some still favour the old system of hand sowing, and with skilful hands at work under suitable weather conditions very fair results can be obtained; however, other methods more economical in regard to seed are now in use. In my opinion the long seed barrow is about the best implement available. It gets over the ground very rapidly, drops the seed close to the ground and gives a far more regular distribution than can be secured by hand scattering. Some seeds, however, are so light and chaffy that they do not feed evenly through the mechanical seeders, and consequently they are best sown by hand; the same argument holds in respect of heavily awned seeds, such as tall oat grass. A calm still day should be selected, and in order to insure a good even strike it is good practice to adopt the system of double seeding. Divide the seed into two halves; sow one part first and then cast the remainder crosswise. The same system should apply whether the seed be sown by hand, seed barrow, mechanical broadcaster, or the ordinary seed drills.

It is unwise to mix together grass and clover seeds, or even very large and very small grass seeds, as the heavier ones, in obedience to the law of gravitation, feed earlier than the others, and so defeat the object in view. Similarly, awned seeds are best sown separately, as they are difficult to mix thoroughly, and it is a tedious matter trying to make them feed regularly through the machine. A good way is to sow the grass and clover seeds separately and at right angles to one another. If, however, this is not possible, and the complete mixture has to be applied at one operation, only a small quantity of seed should be put in the hopper at one time.

Of the various grass seeding machines available, it may be said that they are quite useful for seeds which flow readily through them, but the evenness of the seeding depends too largely on the uniformity of the man's pace, and again they are incapable of very fine adjustment. With seeds of about the same size and weight, they afford a handy and rapid means of sowing, but since they cast their seed very high into the air the absence of even slight winds is an absolute *sine qua non* in regard to their use.

When the grass seeder attached to the ordinary grain manure drill is called into requisition the coulters should be set as close together and as shallow as possible. They are useful for sowing grass seed in the spring on a grain crop that has developed too far to permit of broad-casting, but this advantage is not a very weighty one, as except on wet land the over-growth could be profitably fed back by turning in a good sized flock of sheep for a short period. In regard to the covering of the seed, the aim should be to have the seeds just barely covered—hence the paramount importance of providing a finely broken seed bed. Whenever seeds have been sown by hand, barrow, or machine, a brush harrow, or a very light tine harrow, will be sufficient to secure the desired soil covering. On light soils the roller should first be used to consolidate the land and to press the seeds firmly in. A light harrowing should follow immediately to avoid undue loss of moisture, and caking of the surface. Harrowing and rolling are unnecessary when grass seed is sown on a growing crop, or when a coulter drill has been employed. The smaller seeds hardly require covering so far as germination is concerned, but the loss caused by birds is so great that the operation is an indispensable one. About half an inch of soil is sufficient cover for such seeds as clover, foxtail, cocksfoot, &c., whereas the larger varieties, which are best sown through a drill, do better at a depth of from 1 inch to 2 inches. On strong clayey soils only a very light roller should be used, for if the surface be made too granular and heavy rain should fall, the soil will run together and set hard on the top, thus interfering with free germination. It is important, however, to recognise the inadvisability of disturbing the soil whilst the seeds are germinating, as the young plants are so easily killed at that stage.

Manuring of Pastures.

This is doubtless the most complicated manurial problem at the present time. In a good permanent pasture we have to deal with a large variety of plants representing different genera and even different natural orders. Each makes its own special demands upon the soil fertility, and each is capable of being stimulated by the application of just those particular plant foods that it stands most in need of. The problem, then, that confronts us is how to increase the total yield of the field without upsetting the natural balance and changing the composition of the turf. It is an established fact that unmanured pasturage shows a far more complex composition than that which has been regularly and liberally dressed, and this is solely due to the fact that a few species have been unduly encouraged to the extinction of others. Where hay-growing is the primary object, the knowledge is taken advantage of to promote a more even and a bulkier crop of forage than could ever be obtained from a well mixed sward, and care is taken that the same manure is used in every season so that the greatest benefit possible may be derived, for even such closely related fertilizers as nitrate of soda and sulphate of ammonia favour different grasses. However, for permanent grass lands—and it is these we are now considering—such a system is in every way unsuited. Pasturage is expected to furnish

succulent fodder for stock during as much of the year as possible, and in order that it may do this it is imperative that a large number of different kinds of plants enter into its composition; and these plants must have been so selected that a sufficiency of early, medium, and late varieties is provided to supply a continuous succession of young leaves and shoots over the whole paddock. If we examine any useful old pasture, natural or artificial, we will always find that it consists not of one or two grass species, but of several, and a like number of clovers, and in addition a number of other plants belonging to different genera. We may safely take a lesson from nature's book, and make this condition our aim and ambition. By using judgment it is in most instances possible to secure a satisfactory braird of well-mixed herbage, but the difficulty is to maintain it as such.

Before proceeding to discuss the practical side of grass manuring we will do well to review the results obtained by Lawes and Gilbert at their famous Rothamsted Experimental Station. Their researches date from 1856, and have been conducted on about twenty different plots of mixed herbage, occupying some seven acres in all. The soil is a stiff red loam, and has carried grass continuously for as long as history relates. Up to 1874 the lattermath was grazed off by sheep, but since that time no stock have been depastured there. A very complete series of manurial tests have been carried out on these plots, and in summing up the whole question of the influence of fertilizers on the character of the herbage, A. D. Hall, Director of the Station, makes these pertinent remarks:—

"The various species are differently stimulated by particular manures; even among the grasses themselves such a difference of habit as a deep or shallow root system will determine to which manure the grass will respond. The aspect of any meadow represents the results of severe competition among the various species represented. The dominant species are those most suited to their environment, that is to the amount and nature of the plant food in the soil, the water supply, the texture of the soil and other factors. If any of these factors be altered . . . by manuring in different fashions, the original equilibrium between the contending species is disturbed; some species are favoured and increase at the expense of the others until a new equilibrium is attained, and the general character of the herbage from a botanical point of view is completely altered. The fallacy of the belief that grass land is not responsive to fertilizers is shown by a glance at the unmanured plots, which have become so impoverished that weeds have come to form nearly 50 per cent. of the produce. On one portion of this plot farm-yard manure was applied annually for the first eight years at the rate of 14 tons per acre, and the good effects of it are still to be seen in the yield—that is, after an interval of forty years!"

Nitrogen Only.—When nitrogenous manures were applied singly and continuously, the effect was to squeeze the legumes out altogether. The plot manured with ammonium sulphate became sour, and did not yield so well as the nitrate of soda plot. The superiority of the latter is probably due to the fact that it sinks deeply into the soil, thereby encouraging deeper rooted plants, which are better able to obtain moisture and nutriment in times of drought. And further, the soda helps to make potash available.

Phosphoric Acid Only.—On this plot the grasses and clovers have "run out" to an even greater extent than on the unmanured plot. This illustrates the ultimate result of continuous single manuring. An occasional dressing of phosphatic manure gives a striking result because plenty of nitrogen and potash is lying latent in the soil, but when persistently applied weeds usurp the place previously occupied by nutritious grasses.

Potash Omitted.—The omission of potash from the manurial dressing occasioned a reduction of about 25 per cent. in the yield, a continuous loss of fertility and the diminution in the proportion of clover and allied plants.

From these results it is clear that for hay meadows, nitrogenous manures are indicated, whilst pastures need potash and phosphoric acid. Lime and gypsum also increase the proportion of legumes, but they do so only when there is a supply of potash lying dormant in the land. In other words they act by liberating the residues of potash that have accumulated in the soil. This potash encourages the clovers just as freely as the direct application of a potassic fertilizer would do. The truth of this theory of the indirect stimulation of legumes is shown by the fact that whenever lime was applied to soils deficient in potash no appreciable effect was observed, but when sown on soils rich in potash residues a marked increase in yield and in the development of clovers and trefoils soon followed. In any case a good dressing of lime is a very necessary thing for nearly all grass land as the decaying organic matter which accumulates in the surface soil generates vegetable acids, and these require to be neutralized and the soil sweetened if full returns are desired.

The best natural manure for grass land is dung or farm-yard manure, given either in the form of a special application in the autumn or as a natural deposition by grazing stock. It seems that whereas sewerage has the effect of stimulating the true grasses yard-manure produces practically no injurious changes in the composition of the sod, and is consequently held in high favour by practical men. Indeed, even when it is deemed necessary to add more concentrated fertilizers to grass land, farmers often prefer to bring about the same result by feeding concentrated food stuffs to stock in the field. Under Victorian systems of husbandry no great amount of farm-yard manure will be available for pastures, and we have therefore to fall back on artificial fertilizers. Of these kainit, basic slag, and bonedust merit consideration. Usually there is a sufficiency of assimilable nitrogen in our soils so that a mineral manure containing phosphoric acid and potash will meet our requirements. On grass-growing paddocks the more slowly acting fertilizers are generally to be preferred as they furnish a continuous supply of nutriment throughout the year. On good strong soils, apply a winter dressing of from 2 to 2½ cwt. of bonedust every second or third year combined with 2 cwt. of kainit. Superphosphate or basic slag may be substituted for bonedust in the case of a weak struggling stand of grass which requires a stimulant, and along the coastal areas it will be wiser to substitute ½ cwt. of muriate or sulphate of potash as they contain practically no salt, whereas kainit consists very largely of it.

The important point to dwell upon, however, is not the actual fertilizer to be employed but the absolutely urgent necessity of realizing the foolishness of attempting to establish and maintain permanent grass paddocks on a starvation ration. There is a big drain on the phosphates of the land when young stock and milking cattle are used to graze down the pasture, and this has to be made good, otherwise the grasses will run out. The effect of kainit is to supply potash and so induce luxuriant clover growth. Basic slag and bonedust both contain lime, while superphosphate of lime is rich in gypsum, so that they all tend to increase the amount of available potash as well as to directly supply phosphoric acid. Except when dealing with a weak plant, basic slag seems preferable, as it not only supplies a large percentage of citrate soluble plant food, but the lime it contains is in a free

condition, and consequently has a more important indirect influence on the soil and crop than the other forms of phosphatic fertilizers. Old pastures are all the better for an occasional winter dressing of lime at the rate of 8 cwt. or 10 cwt. per acre to sweeten the ground and enhance the yield.

General Management.

1. Of Young Grass.—Autumn sown fields should be rolled, and, if well forward, should be topped with the mower before the winter, so as to induce a firm rooting, and encourage young crowns to tiller well, and spread over the whole surface. When the spring growth starts, the roller should be again used to strengthen the stand and to counteract the "heaving out" effects of the winter frosts. Care should be taken that the young grass does not run to seed, as many of the weaker grasses disappear after flowering. Again, those grasses, like meadow fescue and crested dog's tail, that take several years to come into full use, are almost invariably thrown back if allowed to seed during the first year or two; consequently the whole field suffers a serious set back and the yield is impaired. On good country where there is not much danger of the soil poaching, or of the young grass being trodden out, the first summer's grass may be fed down with young cattle, but on no account should sheep or horses be grazed, as they bite far too close and are apt to nip the heart out of the young plants, particularly of the young clovers. Not until the second season should other than horned stock be turned into young grass. It is folly indeed to go to the trouble and expense of laying down a good field of grass, and then to cripple it in its youth by feeding it bare in defiance of the teaching of centuries of experience. On some classes of land and in certain seasons it will pay better to run the mower over the young leaves and cart the stuff off for green feed or silage or convert it into hay. The aftermath can then be fed off with young cattle.

The ill-effects to be feared from stocking young grass too heavily, or too early, are the treading out of the tender varieties, the uprooting of the insecure plants, and the altering of the composition of the herbage due to the partiality shown for the more palatable clovers and certain of the grasses. In the following autumn the fields should be chain-harrowed to distribute the droppings evenly over the field. This is a practice which is sadly neglected in Victoria to the detriment of our pastures, and it may be well to know that it is religiously carried out each year by New Zealand farmers in respect of both young and old pastures. Evidently, they clearly recognise that all but a small percentage of the nutriment taken out of the soil is restored in the dung, and that, therefore, in order to get the full benefit from the stock grazed, the manure must not be allowed to lie in small heaps all over the paddock.

Spring sown mixtures when seated on a nurse crop cannot be touched until after the crop has been harvested. An examination of the stubble should then show the young grass, but the appearance is not infrequently disappointing. In a good season a fair amount of young grass and clover will be found in the butts of the sheaves, but after a dry year, little or no appearance of the growth may be visible. However, a few timely showers will promote such rapid germination and growth that hope should not be abandoned too readily.

2. Old Pastures.—First and foremost I would mention the autumn spreading of stock droppings so that the soluble food they contain may be

washed down to the roots. This "dragging" as it is termed, becomes an even more important matter when the stock are receiving hay, chaff, bran, or other concentrated fodder in addition, as the manure is thereby made richer in its fertilizing elements. The "dragging" of the pasture also tends to break the soil surface and to let the air into the roots.

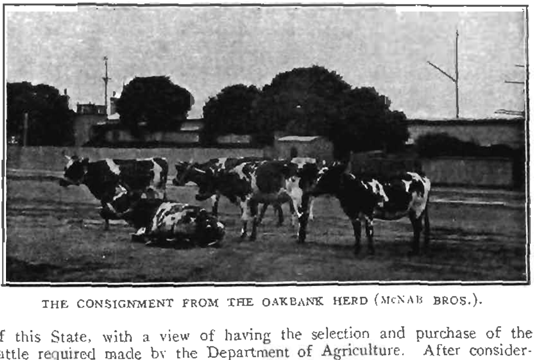
Always avoid over-stocking, especially in the wet months of the year, as heavy stock can do an incalculable amount of harm in a very short time, both by continuous treading and by feeding the crowns so bare that they are destroyed by the frosts.

The question of manuring has already been dealt with at some length and it remains only to say that no pasture can ever be self-supporting. When properly treated it is true that the fertility of the surface soil increases from year to year, but this can never be the case in heavily stocked pastures which are never manured.

Finally I would emphasize the importance of a good lime dressing as a means of sweetening the soil, destroying the moss, and hastening the decay of the accumulating humus that is steadily breaking down into available plant food.

VICTORIAN CATTLE FOR INDIA.

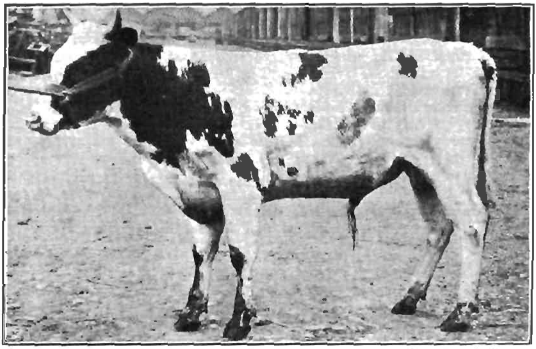
The Army Department of the Government of India recently decided to establish dairy herds in the hill country of India to replace the indigenous breeds of cattle that are of very poor quality for milking purposes. Communication was opened up with the Minister for Agriculture



THE CONSIGNMENT FROM THE OAKBANK HERD (McNAB BROS.).

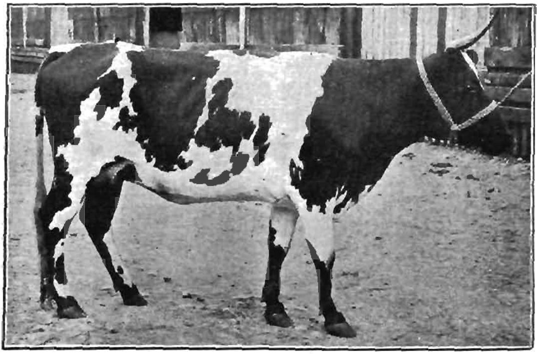
of this State, with a view of having the selection and purchase of the cattle required made by the Department of Agriculture. After considerable correspondence, the Indian Government decided for Ayrshire cattle as the breed most likely to suit their country and requirements. Arrangements for the inspection, selection, and purchase of the stock were placed in the hands of the Chief Veterinary Officer (Mr. S. S. Cameron,

M.R.C.V.S.), who, in conjunction with Messrs. Geo. Howat and Co., stock and station agents, of Melbourne, carried the transaction through. The consignment was got together within three weeks, and shipped from



DOUGLAS CHIEF (1 YEAR 1 MONTH), BY LORD DOUGLAS (IMP.), 5848, *ex* MAYFLOWER, BY MINSTREL (329).

Newcastle, per s.s. *Waihora.* The cattle comprised 45 head—40 females and 5 bulls, and were drawn from eight of the leading Ayrshire



ONE OF THE IN-CALF HEIFERS.

herds in this State. Every animal sent was submitted to the tuberculin test by the veterinary staff of the Department of Agriculture, and gave a negative reaction for tuberculosis prior to purchase.

The bulls sent varied in age from twelve months to two years. All the females were in calf to pedigree bulls, the bulk of them carrying their second calf; none were past the third calf.

The Chief Veterinary Officer expresses the opinion that the consignment will afford an opportunity, if judicious crossing is resorted to, of definitely establishing the Ayrshire breed on a high level in India; so many lines of blood being represented in the consignment, and all these of excellent strains, whose merits have been established here for some years, and definitely proved both by show-ring and milking records. Very laudatory comments have appeared in the stock press concerning this shipment of cattle; it being considered that such a representative lot has been sent as will tend to promote further trade between India and Victoria in pedigree stock. The enterprise of the Government of India in this regard has also been the subject of favorable comment.

That the consignment was a typical and representative one will be gathered from the snapshot illustrations published herewith, and from a perusal of the subjoined particulars of the shipment:—

From Mr. Andrew Buchanan, Gleneira, Flinders—

BULL.

Gleneira's Gordon, brown and white, calved 1st November, 1906; sire Donald of Gleneira, by Gleneira (290); dam Glisten of Gleneira (1,023), by Majestic of Oakbank (326).

HEIFERS.

Camellia 2nd of Flinders, white and red, calved 23rd September, 1905; sire Majestic of Oakbank (326); dam Camellia of Flinders, by Red Bluff (359). Served by Raglan of Oakbank (396); sire Jamie of Oakbank (184).

Spot 3rd of Gleneira, brown and white, calved 20th October, 1905; sire Gleneira (290); dam Spot of Gleneira, by Edgar (177). Served by Lad o' Kyle (imported); sire General Buller; dam Lass o' Kyle.

From Messrs. Cumming and Brisbane, Gowrie Park, Weerite—

BULL.

Young Lumie, red and white, calved November, 1905; sire Luminous of Oakbank (456), by Jamie of Oakbank (184); dam Young Princess, by Dahlia's Adonis (172, A. H. B. of A.).

HEIFERS.

Sweetheart, brown and white, calved April, 1905; sire Duke of York (277); dam Sweet Briar, by Master of Gowrie (327). Served by Royal King (438, A. H. B. of A.).

Young Maggie, red and white, calved 30th September, 1905; sire Happy Jack; dam Maggie 1st, by General. Served by Duke of York (277, A. H. B. of A.).

Starlight, red and white spotted, calved March, 1905; sire Master of Gowrie (327); dam Mack, by Dote (120, A. H. B.). Served by Royal King (438, A. H. B. of A.).

Myrtle 3rd, red and white, calved February, 1905; sire Duke of York (277); dam Myrtle 2nd, by Master of Gowrie. Served by Royal King (438, A. H. B. of A.).

Daisy Belle, red and white, calved March, 1905; sire Duke of York (277, A. H. B. of A.); dam Daisy Belle, by Lord Roberts (317). Served by Heather Jock 2nd (287, A. H. B. of A.).

Red Queen (327), red and white, calved February, 1905; sire Master of Gowrie (327); dam Queenie, by White Laddie (223). Served by Royal King (438, A. H. B. of A.).

Lustre 3rd, spotted red and white, calved March, 1905; sire Duke of York (277, A. H. B. of A.); dam Lucky, by Master of Gowrie (327). Served by Royal King (438, A. H. B.)

Lady Grace, white and red, calved March, 1905; sire Master of Gowrie (327, A. H. B. of A.); dam Brownie, by Heir of Randwick (48, A. H. B.). Served by Heather Jock (387, A. H. B.).

From Mr. T. A. Grant, Glen Elgin, Toolern Vale—

BULL.

Warwick, brown and white, ear tag 245, calved 3rd May, 1904; sire Glen Elgin's Standard Bearer (300); dam Beauty 2nd (422), by Bruce (11).

HEIFERS.

Moss Rose of Glen Elgin, red and white, calved 13th April, 1905; ear tag 292; sire Lucre of Oakbank (321); dam Spottie of Glen Elgin (1,513), by Glen Elgin's Zulu (302). Served by Renown of Oakbank.

Mignonette of Glen Elgin, marked tag 273, calved 27th September, 1904; sire Glen Elgin's Standard Bearer (300, A. H. B.); dam Red Rose of Glen Elgin, by General (450). Served by Warwick.

Marjorie 2nd of Glen Elgin, red and white, calved 29th November, 1904, marked tag 282 near ear; sire Lucre of Oakbank (321); dam Marjorie of Glen Elgin (1,500, A. H. B.), by Glen Elgin's Zulu (302). Served by Warwick.

From Mr. George Keys, Wethersdane Park, Dandenong—

HEIFERS.

Royal Pride 2nd (1,276, A. H. B. of A.), white and brown, calved August, 1902; sire Royal Warren of Nethercraig (411, imported); dam Pride of the Lake, by White Laddie (223, A. H. B. of A.). Served by Magician.

Patience, dark yellow and white, calved 1st August, 1905; sire Raglan of Oakbank (306); dam Purity 3rd (1,233), by Academist of Oakbank (161). Served by Bonnie Lad.

Ella, red and white, calved 1st October, 1903; sire Comet; dam Nell, by Armourer (104). Served by Molly's Record.

Minnie 2nd, red and white, calved 29th January, 1904; sire Comet; dam Cherry 3rd, by Chief Justice. Served by Magician.

Muriel, red and white, calved 2nd February, 1904; sire Comet; dam Hazel, by Nipper. In calf to pure Ayrshire bull.

From Mr. Wm. Kirkham, Woodside, Lyndhurst—

HEIFERS.

Lulu of Woodside, calved 28th December, 1905; sire Victory, by Viceroy (420, vol. v.); dam Red Loo, by Viceroy (420). Served by Gleneira.

Empress 2nd; sire Bonny Jock of Glenarthur (393); dam Empress, by Duke of Glenside (173). Served by Gleneira.

Mavis of Woodside, calved 30th July, 1905; sire Daintie's Victor, by Victor of Munnoch (imported, 90); dam May, by Paisley. Served by Leeroy of Woodside.

Bolinda of Woodside, calved 14th July, 1905; sire Bonnie Dundee, by Laird o' Logan; dam Birdie, by Viceroy (420, vol. v.). Served by Leeroy of Woodside.

Dahlia of Woodside, calved 13th August, 1905; sire Bonnie Dundee, by Laird o' Logan; dam Dewdrop, by Daintie's Victor. Served by Leeroy of Woodside.

Young Lady of Woodside, calved 30th May, 1906; sire Daintie's Victor, by Victor of Munnoch (imported, 90); dam Lady, by Viceroy (420). Served by Gleneira.

Mirror of Woodside, calved 20th September; sire Daintie's Victor, by Victor of Munnoch (imported, 90, A. H. B.); dam Myrtle, by Bonny Lad.

Primrose of Woodside, calved 15th May, 1905; sire Daintie's Victor, by Victor of Munnoch (imported, 90); dam Pansy, by Viceroy (420, A. H. B., vol. v.). Served by Leeroy of Woodside.

From Messrs. Wm. McNab and Bros., Oakbank, Tullamarine—

BULL.

Arum, brown and white, calved April, 1905; sire Glen Elgin's Zulu; dam Amy Castles of Oakbank, by Perfection of Oakbank.

HEIFERS.

Flo, 26 ear tag, brown and white, calved July, 1906; sire Alpha of Oakbank; dam Sultana, by Pure Marquis. Served by Prelate of Oakbank.

Jolly, brown and white, calved 25th October, 1904; sire Prince of the Valley, by Royal Prince; dam Jessie 3rd, by Buccleuch. Served by Prelate of Oakbank.

Flossie, brown and white, calved 25th October, 1904; sire Prince of the Valley, by *Royal Prince*; *dam Peter's Fuchsia*, by *Peter Simple* (*145, A. H. B. of A.*). Served by Prelate of Oakbank.

Belle, brown and white, calved 1904; sire Prince of the Valley, by Royal Prince; dam Buttercup, by Peter Simple (145, A. H. B. of A.). Served by Prelate of Oakbank.

Jessica, brown and white, ear tag 24; sire Prince of the Valley, by Royal Prince; dam Jasmine, by Royal Prince. Served by Prelate of Oakbank.

Nancy of Glen Elgin, vol. vi., red and white, calved 20th September, 1905, tag 315 near ear; sire Lucre of Oakbank (321); dam Marigold of Glen Elgin (1,498), by Gordon (38). Served by Renown of Oakbank.

Snowflake of Glen Elgin, vol. vi., red and white, calved 31st August, 1905, tag 310 near ear; sire Lucre of Oakbank (321); dam White Rose of Glen Elgin, by Gordon (38). Served by Renown of Oakbank.

From Messrs. Sime Bros., Fern Hill, Lyndhurst—

HEIFERS.

Primrose of Fernhill (1,649), red and white, calved 20th February, 1905, ear tag 133; sire Pensioner of Oakbank (337); dam Primrose of Fernhill (1,216), by Royalty (365). Served by Glen Elgin's Field-Marshal (294).

Belle of Fernhill (1,640), calved 2nd August, 1904, dark red and white, ear tag 128; sire Pensioner of Oakbank (337); dam Little Bell, by Loyalist. Served by Glen Elgin's Field-Marshal (294).

Pearl of Fernhill (1,648), red and white, calved 10th February, 1904, ear tag 140; sire Pensioner of Oakbank (337); dam Primrose of Fernhill (1,216), by Royalty (365), Served by Glen Elgin's Field-Marshal (294).

Boronia 2nd, red and white, calved July, 1904, ear tag 127; sire Pensioner of *Oakbank* (337); *dam Bella 2nd*, by *Prince of Wales (69)*. Served by Glen Elgin's Field-Marshal (294).

Fashion 1st, brown and white, calved 1st February, 1905, ear tag 125; sire Pensioner of Oakbank (337); dam Mabel, by Royalty (365). Served by Glen Elgin's Field-Marshal (294).

From Mr. G. L. Wilson, Wilson House, Berwick—

BULL.

Douglas Chief, white and brown, ear tag No. 8, calved 18th December, 1906; sire Lord Douglas (imported, 5,848, A. H. B. of S.; 501, A. H. B of A.); dam Mayflower, by Minstrel (329, A. H. B. of A.).

HEIFERS.

Amy 2nd, brown and white, calved 20th March, 1905, ear tag No. 9; sire Royal Record (361, A. H. B. of A.); dam Amy, by Theodore. Served by the imported champion bull Lord Douglas.

Lady Ada 5th, white and yellow, calved January, 1906, ear tag No. 10; sire Record Junior (*360, A. H. B. of A.*); *dam* Lady Ada (1,063, A. H. B. of A.), by Lord Douglas of Fyans (2,345, A. H. B. of S.). Served by The Captain of Loch Lomond (imported, 498, *A. H. B. of A.*).

STATISTICS.

Rainfall in Victoria.

THIRD QUARTER, 1908.

TABLE showing average amount of rainfall in each of the 26 Basins or Regions constituting the State of Victoria for each month and the quarter, with corresponding monthly and quarterly averages for each Basin deduced from all available records to date.

Basin.	July.		August.		September.*		Total for Third Quarter.	Average for Third Quarter.
	Amount, 1908.	Average.	Amount, 1908.	Average.	Amount, 1908.	Average.		
	inches.	inches.	inches.	inches.	inches.	inches.	inches.	inches.
Glenelg and Wannon Rivers	1·71	2·91	1·96	3·10	4·76	2·71	8·43	8·72
Fitzroy, Eumerella, and Merri Rivers	3·20	3·37	2·07	3·19	4·65	3·08	9·92	9·64
Hopkins River and Mount Emu Creek	1·66	2·29	1·73	2·43	4·30	2·55	7·69	7·27
Mount Elephant and Lake Corangamite	1·81	1·90	1·65	2·34	4·07	2·39	7·53	6·63
Cape Otway Forest	4·23	3·68	3·52	4·01	4·94	3·52	12·69	11·21
Moorabool and Barwon Rivers	1·59	2·31	1·69	2·38	3·73	2·60	7·01	7·29
Werribee and Saltwater Rivers	1·13	2·11	1·85	2·48	2·24	2·39	5·22	6·98
Yarra River and Dandenong Creek	2·21	3·10	2·97	3·06	3·31	3·26	8·49	9·42
Koo-wee-rup Swamp ...	2·12	2·94	2·62	2·94	3·12	3·26	7·86	9·14
South Gippsland	3·61	3·41	3·10	3·95	3·90	3·66	10·61	11·02
Latrobe and Thompson Rivers	2·50	2·71	3·35	3·53	3·64	3·36	9·49	9·60
Macallister and Avon Rivers	1·31	1·53	1·35	2·45	3·20	2·08	5·86	6·06
Mitchell River	1·17	1·91	2·16	2·65	3·27	2·33	6·60	6·89
Tambo and Nicholson Rivers	0·97	2·20	1·60	2·61	4·73	2·15	7·30	6·96
Snowy River	1·48	3·44	2·58	3·27	8·72	3·06	12·78	9·77
Murray River	1·23	1·86	1·62	2·26	2·19	1·83	5·04	5·95
Mitta Mitta and Kiowa Rivers	2·64	3·11	2·09	3·33	4·63	3·05	9·36	9·49
Ovens River	2·73	3·89	2·14	4·29	4·91	3·99	9·78	12·17
Goulburn River	1·61	2·34	2·42	2·83	2·53	2·31	6·56	7·48
Campaspe River	1·28	2·24	2·75	2·69	2·30	2·18	6·33	7·11
Loddon River	0·92	1·48	2·04	1·92	2·08	1·54	5·04	4·94
Avon and Richardson Rivers	0·62	1·28	1·80	1·68	2·80	1·33	5·22	4·29
Avoca River	0·87	1·42	1·90	1·74	2·37	1·35	5·14	4·51
Eastern Wimmera	0·95	2·16	2·17	2·37	3·66	1·88	6·78	6·41
Western Wimmera	1·05	2·14	1·51	2·27	3·89	1·84	6·45	6·25
Mallee Country	0·90	1·15	1·53	1·37	3·10	1·06	5·53	3·58
The whole State	1·53	2·21	2·08	2·51	3·34	2·21	6·95	6·93

* Figures in these columns are subject to alterations when the complete number of returns for September has been received.

R. F. GRIFFITHS,
Acting Commonwealth Meteorologist.

Perishable and Frozen Produce.

Description of Produce.		Exports from the State.		Deliveries from the Government Cool Stores.	
		Quarter ended 30.9.1908.	*Quarter ended 30.9.1907.*	Quarter ended 30.9.1908.	Quarter ended 30.9.1907.
Butter ...	... lbs.	1,392,888	3,779,800	461,440	1,750,880
Milk and Cream	... cases	3,409	11,998	70	...
Cheese ...	... lbs.	113,640	220,440	4,880	180
Ham and Bacon	... ″	406,560	671,040	...	...
Poultry ...	... head	1,660	4,365	3,383	1,704
Eggs	... dozen	...	30,870	2,503	12,591
Mutton and Lamb	carcasses	566	9,454	806	2,229
Beef	quarters	8	255	955	...
Veal	carcasses	768	1,559	300	76
Pork	... ″	38	243	...	33
Rabbits and Hares	... pairs	985,398	2,007,432	127,871	527,826
Fruit ...	... *cases*	585	*6,418*	1,506	564
″ Pulp ...	... ″	...	...	...	...
Sundries ...	... lbs.	...	...	7,081	3,734

R. CROWE, *Superintendent of Exports.*

Fruit, Plants, Bulbs, Grain, &c.

Goods.	Imports.		Exports.	
	Inter-State.	Oversea.	Inter-State.	Oversea.
Apples ...	38,649	—	791	110
Artichokes	2	—	—	—
Asparagus...	1	—	—	—
Barley ...	5,737	—	—	—
Beans ...	97	219	—	—
Bulbs ...	2	22	10	—
Bran ...	—	937	—	—
Bananas, b/s.	40,552	51	—	—
Bananas, c/s.	8 808	219	512	6
Cucumbers	663	—	60	—
Carrots ...	5	—	—	—
Cocoanuts ...	126	121	—	—
Currants ...	—	2,150	—	—
Chillies ...	7	10	—	—
Dates ...	—	300	—	—
Figs ...	-	—	2	—
Garlic ...	—	1	—	—
Granadillas	3	—	—	—
Green Ginger	13	27	—	—
Lemons ...	4,435	—	69	1,533
Limes ...	—	—	1	—
Loquats ...	152	—	6	—
Maize ...	590	5,607	—	—
Mixed fruit	4	—	—	-
Mangel Wurzel ...	10	—	—	—
Mace ...	—	10	—	—
Nutmegs ...	69	239	—	—
Nuts ...	31	1,024	20	—
Total ...	93,956	10,937	1,471	1,649

Goods.	Imports.		Exports.	
	Inter-State.	Oversea.	Inter-State.	Oversea.
Oats ...	7,037	32,401	—	—
Onions ...	2	40	—	—
Oranges ...	94,451	—	391	747
Passion fruit	6,568	—	—	—
Peas ...	1,769	—	—	—
Peas (green)	144	100	—	—
Paw-Paws	3	—	—	—
Parsnips ...	2	—	—	—
Pineapples	19,913	—	480	474
Plants ...	336	577	401	423
Pumpkins...	128	—	2	—
Potatoes ...	41,781	—	10	—
Pears ...	11	—	2,404	—
Pomelos ...	—	5	—	—
Rice ...	1,252	14,585	—	—
Rhubarb ...	1	—	—	—
Shaddocks	8	—	—	—
Seeds ...	769	3,407	—	—
Strawberries	118	—	—	—
Sweet Potatoes (Yams)	56	66	—	—
Tomatoes ...	658	—	4	—
Turnips ...	6,022	—	53	—
Vegetables	—	103	917	—
Jams, Sauces, &c. ...	—	—	—	688
Dried fruits	—	—	7	2,174
Fruits in Liquid ...	—	—	—	3,367
Grand Totals	280,985	62,221	6,140	9,522

Total number of packages inspected for the quarter ended 30th September 1908 = 358,868.

J. G. TURNER, *Senior Inspector Fruit Imports and Exports.*

THE PROCLAIMED PLANTS OF VICTORIA.

(*Continued from page 592.*)

Alfred J. Ewart, D. Sc., Ph. D., F.L.S., Government Botanist; and J. R. Tovey, Herbarium Assistant.

The Thorn Apple.

Datura Stramonium, L. (*Solanaceæ*).

A stout erect annual often over 2 feet high, with forked branches, between which or at their ends the flowers arise singly on short stalks. It bears large almost triangular irregularly toothed leaves. The long tubular calyx falls off after flowering, leaving a more or less prominently toothed rim under the capsule, which usually splits into segments during ripening. The corolla is large white or purple and with five short usually yellowish points, capsule globular, prickly, with numerous dark wrinkled seeds.

The Thorn Apple, a native of the East Indies originally, is now spread over the whole globe. It appears to be spreading over Victoria, and contains a highly poisonous narcotic alkaloid, Daturin. Fortunately, the strong bitter taste of its leaves usually keeps stock from eating it, but this very fact, and its abundant production of seed, aids the plant in spreading rapidly. As an annual it can be kept under on pasture land and waste places, by hoeing or pulling up before it has time to seed. If the plants are at all old they should be piled and burnt on the spot to destroy the seeds. On arable land, it is kept under by the ordinary process of cultivation, harrowing to destroy seedlings as the seeds germinate. Care should be taken to prevent any plants becoming old enough to seed, and also to prevent fresh introduction with impure seed. The dark wrinkled seeds are unlike those of any common cultivated plant.

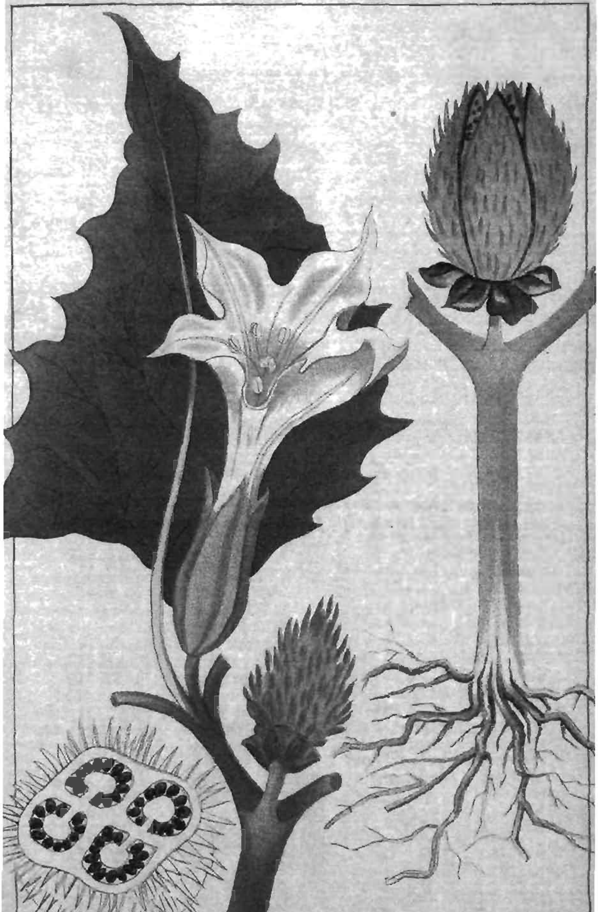
Proclaimed under the Thistle Act for the whole State, June, 1907.

Two tobaccos, members of the same Order as the preceding, are also common, but are not proclaimed.

Nicotiana glauca, Graham.—The Tree Tobacco is a shrubby garden escape, introduced from South America, which seems likely to become a nuisance in some of the northern districts, though of use for producing rapidly-growing shelter hedges. In excess the plant is undoubtedly poisonous, though moderate quantities can be eaten without serious consequences. Fortunately, it is not very palatable, although, as in the case of many poisonous or injurious plants, stock may acquire a morbid taste for it. The plants should be dug up, piled, and burnt before flowering. Deep ploughing buries any seeds present in the soil, and they soon die.

Nicotiana suaveolens, Lehm, is a similar but small native tobacco, which, like the former, is comparatively resistant to drought, also feebly poisonous and apt to become a troublesome weed if allowed to spread.

PLATE 30.



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THE ELEMENTS OF ANIMAL PHYSIOLOGY.

W. A. Osborne, M.B., D.Sc., Professor of Physiology and Histology, Dean of the Faculty of Agriculture in the University of Melbourne.

(*Continued from page* 640).

XIV. Renal Excretion.

The functions of the kidneys may be epitomised as follows:—

1. Waste matter and foreign or harmful substances are removed from the blood.

2. The blood is kept neutral in reaction. If it tends to get acid the kidney removes the acid excess, if alkaline then the alkali excess is eliminated.

3. The blood is standardized as to the concentration and relative proportions of its salts. As has been stated in the chapter on blood, not only the total amount but the proportion between the individual salts in the blood remains constant. As, however, the supply of salts in the food is very variable, some adjustment is necessary and this we find in the kidney.

THE MECHANISMS OF RENAL EXCRETION.

The artery entering the kidney divides and subdivides until there are formed thin, straight arterioles which radiate from within outwards. Arising from these straight vessels and almost at right angles with them are a number of smaller arterioles. These finer arterioles then form peculiar structures just visible to the naked eye—the GLOMERULI. These in reality are produced by each fine arteriole being wound on itself to form a convoluted tuft like a tangle in a cord. Wrapped closely around the glomerulus is a double-walled capsule with an opening in it (Fig. 55).

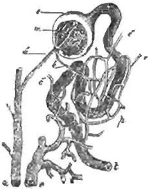


Fig. 55. Diagram showing straight arteriole, *a*; glomerulus, *m*; capsule, *f*; capillary plexus, *e'*; and tortuous tube, *t*. (After *Bowman*.)

A good picture of the shape of the glomerulus can be obtained by imagining a piece of thin rubber tubing folded into a knot or a bunch whilst around this is closely applied a collapsed rubber balloon. Now the function of the glomerulus is to act as a filter. The blood enters the glomerulus under the pressure given it by the pumping heart and, as there is some resistance to the outflow, it is forced not only through the capillary wall but also into the adjacent wall of the capsule. A filtrate, therefore, collects in the space between the two walls of the capsule. Now the membrane of which

the capsule is composed is such that water and the salts of blood, and presumably also urea, can pass through, but the other constituents, with the corpuscles, are held back and remain in the blood stream. Such a filter as this is not unknown in physical science. A clay cell soaked in hot gelatine solution and then allowed to cool, so that the gelatine sets in the pores, can be used as a filter, allowing water and the simple constituents present in blood to pass through, but retaining the corpuscles and albumens and other complex constituents. In the capsule, therefore, there collects a watery filtrate from the blood: this escapes from the opening mentioned above and travels down a tortuous tube and finally, being collected in special ducts, is poured out as urine into the pelvis of the kidney. But a great change occurs in the fluid as it passes through the tortuous or "convoluted" tube. The blood which has been concentrated and which has lost some of its dissolved constituents in the glomerulus leaves the latter by a small vessel and then flows in a network of capillaries which embraces the convoluted tube. Here a good part of the water and some of the salts are re-absorbed back into the blood; but typical urinary constituents are left alone. The lining cells of the tortuous tube also have the power of picking out from the blood certain urinary ingredients such as the pigments or foreign substances which have not passed through the glomerular membrane, and of adding these to the urine within. Even hæmoglobin which has escaped from corpuscles, when these are diseased or in any way broken up, is treated as a foreign body and is thrown out into the urinary stream. The cells also of the tortuous tube have also the faculty of standardizing the blood as to reaction and salt content. The blood finally leaves the meshwork of the capillaries purified and standardized whilst the fluid in the tortuous tube is now ordinary urine and is ejected as such. The kidney contains many thousand glomeruli with their attendant tortuous tubes and plexus systems.

It will be evident from the above statements that the flow of urine will be increased—

1. If the blood pressure be raised;

2. If the kidney vessels are dilated admitting more blood to the glomeruli and at higher pressure; this occurs with drugs like turpentine and caffeine:

3. If absorption in the tortuous tubes is hindered; this occurs after administration of sulphates;

4. If the blood be watery as occurs after copious drinking unaccompanied by heavy sweating.

The converse of these will reduce the flow of urine.

The urine collected in the pelvis of the kidney flows along a tube called the URETER being driven by peristaltic contractions. Each ureter enters the bladder so obliquely that a valve is formed effectually preventing any back-flow. The bladder is a hollow organ well supplied with elastic tissue and smooth muscle in its walls. Its nerve supply and its capacity relative to the animal's size, vary with different species and are connected with the animal's habits. Thus the cow can void urine while walking, the horse as a rule only when stationary, whilst the carnivore, being a hunting animal, is fitted with an unusually capacious bladder and one more under voluntary control, so that it can stalk its prey without betraying its presence by passing urine. The expulsion of urine from the bladder through the urethra is a reflex action excited by tension of the bladder wall or

irritation of the mucous membrane. It can be started or stopped by voluntary effort. The nerve centre for this reflex lies in the lower spinal cord.

THE URINE.

The amount passed *per diem* varies with the age and species and in each animal with the quantity of fluid drunk and inversely as the amount of evaporation from the skin and lungs. The following table gives an idea of the amount passed in twenty-four hours :—

Ox	10 to 25 litres*
Horse	5 to 8 ,,
Pig	1·5 to 8 ,,
Small ruminants	1 to 5 ,,
Man	about 1·5 ,,
Dog	0·5 to 3 ,,
Cat	about 0·3 ,,

Certain chemical substances are important constituents of the urine of all mammals :—

1. Urea, a nitrogenous body containing also carbon, hydrogen and oxygen. If urine be concentrated by evaporation, cooled and treated with nitric acid, a rich deposit of flaky crystals of urea nitrate is formed. Urea is readily attacked by bacteria if urine be exposed to air, and is changed into ammonium carbonate—hence the ammoniacal odour of stables, &c. Urea is derived from protein and the amount excreted in a day varies parallel with the amount of protein eaten. It represents the protein used as energy supply rather than that used for repair.

2. Purin bodies including Uric Acid. These are substances containing the same elements as urea but they are more complex in constitution. They are derived partly from the nucleo-proteins of food and partly from the activity of the nuclei of not only the fixed tissues but also of the white cells of the blood. Uric acid is found in small quantities in herbivores; generally speaking it varies directly with the amount of protein eaten.

3. Kreatinin—containing the same elements as urea but closely allied to a constituent of muscle. Some physiologists regard it as the decomposition product of protein used for muscle repair.

4. Pigments—these which give the characteristic colour to urine are really altered bile pigments which have been absorbed from the gut.

5. Sulphates. Proteins contain sulphur which, in the body, is oxidised to sulphuric acid and leaves the body in the form of sulphates of sodium, potassium, magnesium and calcium.

6. Chlorides of Sodium, Potassium, &c. These are salts of the food and of the blood and are continually being excreted in the urine.

7. Ammonia—fresh urine contains small quantities of this substance probably formed by the spontaneous decomposition of urea.

Striking differences can be observed between the urine of herbivores on the one hand and that of carnivores, of omnivores in whose food protein preponderates, and of all young mammals living exclusively on milk. The urine of the latter class is acid in reaction, is transparent and contains little or no sediment. It also contains phosphates of the four physiological metals in considerable amount and its content of sodium is generally greater than that of potassium. Uric acid is also present in appreciable quantity but aromatic bodies and oxalic acid are found only in traces. Such urine may occasionally show a sediment of uric acid and when, on

* A litre = 1¾ pints.

standing, it becomes alkaline in reaction, phosphates are thrown out of solution as cloudy precipitates. The urine of the herbivores on the other hand is alkaline and turbid. The solid matter held in suspension consists chiefly of carbonates of lime and magnesia so that the urine effervesces on adding acid. Oxalate of lime is also present in the form of minute crystals. Phosphates are present in very small quantities, these substances in herbivores being excreted mainly by the bowel. Potassium is generally in excess of sodium. Hippuric acid and aromatic bodies, including carbolic acid and pyrocatechin, are present in appreciable quantities. The urine of herbivores when placed in a glass vessel will be found to darken from the surface downwards just as a photographic developer will do; in fact some aromatic bodies present in herbivore urine can actually be used for developing photographs! The relatively large quantities of oxalic acid and aromatic bodies are due to the presence of these substances preformed in the food; thus a horse fed on meadow-hay will excrete three times as much hippuric acid as one fed chiefly on oats.

It is interesting to note that, when a herbivorous animal is allowed to starve, its urine becomes similar to that of a carnivore. This is due to the fact that the starving animal lives on its own tissues and is therefore in all truth a carnivore.

The number of waste products and of foreign substances, inert or poisonous, that appear in the urine is very large and no useful purpose could be served by attempting to name them here. Not a year passes but some new ingredient of urine is discovered; but the substances named above constitute by far the greater portion of the solid matter present.

The following table gives an idea of the composition of human urine taking this as a type:—

Quantity in 24 hours	1,500 ccs.*
Urea	30.0 grms.
Uric acid	0·7 ,,
Kreatinin	1·0 ,,
Hippuric acid	0·7 ,,
Other organic matter	2·6 ,,
Total organic matter	35.0 ,,
Sodium chloride	15.0 ,,
Phosphoric acid	2·5 ,,
Potassium	3·3 ,,
Other mineral matter	4·2 ,,
Total mineral matter	25.0 ,,
Total solids	60.0 ,,

In the healthy animal neither blood nor hæmoglobin should be present in the urine. If such appear it means disease or accident, or poisoning by such substances as pine-needles, fox-glove, spurge, &c. Sugar in health is present only in the minutest traces. Albumen is absent, though in most mammals the unrine may contain some slimy mucin or nucleo-protein derived from the urinary tracts—bladder and urethra chiefly. Bile appears in the urine in certain diseases such as jaundice.

XV.—The Afferent Systems.

In Chapter III. it was stated that all nerve impulses entering the nervous system start in definite end-organs or receptors which are specially atruned to some particular form of stimulus. A brief list was also given of the chief types of receptors. These we must now examine in greater

* 1,000 cc. = 1 litre. 1 gram = 15·4 grains.

detail. The various receptors of the body present certain broad outlines of similarity which may be given as follows:—

1. Each receptor is readily responsive to one particular form of stimulus and responsive with difficulty to all other forms. The more delicate receptors are as a rule shielded in great part from stimuli other than those to which they are attuned.

2. If a receptor, or the nerve coming from it, be excited by any form of stimulation, the same sensation is always experienced. Thus if a receptor in the skin responsive to warmth be stimulated by electricity the sensation is warmth; if it be a receptor for cold then the sensation is that of cold. A blow on the eye stimulating the retina or optic nerve gives the sensation of light.

3. A certain intensity of stimulus is necessary with each receptor before it can start a nerve impulse. If the stimulus be increased a limit is reached at which no further increase of sensation can be produced by increasing the stimulus. Between these limits sensations vary in intensity according to the proportion that exists between the stimuli. Thus if the human eye cannot perceive any difference in the illumination of a room lit by ten candles and the same room lit by eleven candles but *can* distinguish if twelve candles are employed, then the same eye regarding the same room lit by a hundred candles could not detect any change until twenty more candles were added.

4. Each type of receptor, except that for pain, can readily be fatigued by its particular stimulus, especially when this is intense. Thus a person entering a room can easily detect the presence of musk or iodoform, but after a few sniffs the sensation vanishes.

The receptors of the animal body can be grouped under the following classes—proprioceptors, interoceptors, skin-receptors, telereceptors, pain receptors, visceral receptors.

PROPRIOCEPTORS.—These are receptors which are set in action by stimuli caused by the animal's movement or position. Impulses arising from them give information as to the position of different parts of the body,

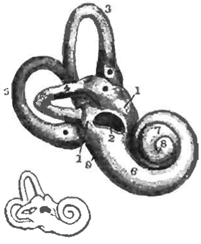


Fig. 56. Semi-circular canals and cochlea. The smaller figure shows the natural size in man. 3, 4 and 5 the semi-circular canals; 6, 7 and 8 the cochlea. 2, elastic window leading to *scala vestibuli*; 9, elastic window leading to *scala tympani*. (After *Sömmering.*)

the extent of movement and the resistance to muscular action. These receptors are found in muscles, tendons and ligaments (see Chapter III.) and are probably excited by strain in these tissues. They are also present in joints being here responsive to pressure and movement. In the head, and

associated with the internal ear, we find on each side a proprioceptive organ. the labyrinth or semi-circular canal system, which possesses a very signal importance (Fig. 56). The leading feature in each labyrinth is the presence of three bony tubes each curved so as to form an arch and communicating with a common reservoir at its base. One arch lies on the flat, that is, in the horizontal plane, whilst the other two are vertical, one running in a fore and aft direction and the other in a side to side direction. Within these tubes is a watery fluid into which dips, in each tube, a brush of fine filamental receptors. Held in suspension in the fluid are certain fine particles of solid matter like sand-grains. Now, in whatever position the head is placed, the solid grains will gravitate in a particular direction, and if the head be moved the fluid by inertia will circulate in a definite manner. It is thus that an animal attains its knowledge of head position and movement. If, in a pigeon, the horizontal arches are destroyed, the bird apparently loses all sense of movement in a horizontal plane and allows its head to wag from side to side. The labyrinth also supplies the requisite information for maintaining a definite posture and for preserving balance. It is to the presence of the labyrinth that we may ascribe that great expansion of the central nervous system called the cerebellum, for it is here that the impulses, continually received from the labyrinth, are co-ordinated and dispatched to other regions of the central nervous system concerned with muscular innervation.

INTEROCEPTORS.—These are found in the lining of the alimentary tube and are concerned with food. In the mouth, and particularly at the back of the tongue, are taste receptors. These respond to various chemical bodies when in solution and give rise to the sensations of sweet, bitter, saline, acid and alkaline. It must be remembered that the majority of the sensations loosely called tastes are really flavours and are detected by the nose which is in communication with the back of the mouth. The sensations of thirst, hunger and satiety are probably referable to receptors in the mucous membrane of the alimentary canal from the pharynx to the stomach.

SKIN-RECEPTORS.—These give the animal cognisance of contact and of the incidence of heat. Scattered irregularly over an area that involves the entire skin and dips, for a short distance, into the mucous membrane of the canals opening on the skin, are receptors that are sensitive to rise of temperature, others to fall of temperature, and others to distortion of the skin (touch). Many hairs are attached at their roots to receptors and owing to the leverage which they exert can give rise to a sensation even on the most delicate displacement.

TELERECEPTORS.—These are receptors which give cognisance of changes in the outside world at some distance from the animal. To them are due the faculties of seeing, hearing and smelling.

1. THE EYE.—This organ may be roughly likened to a photographic camera. It possesses a lens system which focusses a picture of the outside world (when illuminated) on a sensitive surface—the retina—in which are placed receptors specially sensitive to the ethereal disturbances known as light. The structure of the eye is in brief detail as follows (Fig 57). In front is a transparent convex sheet of tissue called the CORNEA which is inserted, like the crystal of a watch, into the very tough white tissue called the SCLEROTIC which constitutes the major portion of the shell of the eyeball. The cornea is well supplied with pain receptors and probably with these alone. It is kept moist, and its surface smooth and free from foreign matter, by the rhythmic wiping action of the upper eyelid, or in some animals by the transversely moving nictitating membrane, the under surfaces

of which are kept lubricated by a secretion formed in a special gland —the lachrymal or tear gland. Painful sensations arising from the cornea give rise reflexly to closure of the lids and copious secretion of tears. The cornea, it may be observed, possesses no blood vessels. Covering the sclerotic in front (*i.e.*, the white of the eye) is a thin sheet allied to the mucous membranes called the CONJUNCTIVA. This is reflected on to the under surface of the lids and is richly supplied with blood vessels which are capable of wide alterations in diameter. The curvature of the cornea is not regular; it resembles more the bowl of a spoon than the surface of a sphere. The direction of the different curvatures varies in different animals. Within the dome of the cornea is a watery transparent fluid—the AQUEOUS HUMOUR. This fluid is under some pressure and so maintains the convexity of the cornea and separates this from the next structure to be mentioned. Floating in the hindmost region of the aqueous humour is a perforated curtain or diaphragm called the IRIS. The iris in all animals (except

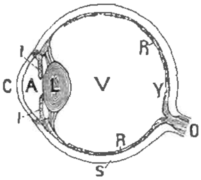


Fig. 57. The Eye.—C, cornea; A, aqueous humour; I, iris; L, crystalline lens; V, vitreous humour; R, retina; S, sclerotic; O, optic nerve.

albinos) is deeply pigmented and is opaque to light. It contains muscular fibres, disposed radially and circularly, which by their contraction can widen or narrow the central aperture called the PUPIL. The iris is plentifully supplied with blood vessels, and by two sets of nerves, a cranial automatic supply, from the third cranial nerve, which constricts the pupil, and fibres from the thoracic autonomic which dilate the pupil. The use of the iris is twofold; it can regulate the amount of light entering the eye and thus shield the delicate receptors within from injury through excess of light, and secondly, when the illumination is sufficient, it can help in forming a clearer retinal image of the outside world by shutting off all rays of light except a narrow central beam—an action which will be familiar at once to all who have had anything to do with photography. The iris works reflexly, that is, automatically. When the retina is in darkness or is feebly illuminated, the pupil is widely dilated; if the light entering the eye increases in intensity the pupil constricts correspondingly. The shape of the constricted pupil varies with different animals, being circular in man and the dog; slightly oval in the rabbit; having the form of a slit which is vertical in the cat, but horizontal in most of the domestic animals. The iris responds to drug treatment giving a dilated pupil with atropine, cocaine and adrenalin and in the latter stages of chloroform anæsthesia, but a narrow pupil with eserine, and opium and in the earlier stages of chloroform anæsthesia. It also varies to some extent with the blood-pressure and the state of the emotions, *e.g.*, fright. The movements of the iris serve this

additional purpose that they act as a circulating agency on the fluids within the eyeball. Immediately behind the iris is the CRYSTALLINE LENS which is composed of transparent laminæ devoid of blood vessels and nerves and arranged like the layers in an onion. The lens is highly elastic and is attached firmly along its border to a sheet of tissue called the CHOROID which sweeps round a great part of the eyeball beneath the sclerotic. The mechanism of focussing for near and far objects in some of the lower vertebrates is carried out in much the same way as in a camera, namely, by moving the lens forwards or backwards. But in mammals this device is supplanted by another, namely, an alteration in the lens itself. When a mammal has its eye focussed for far distance that is, in the resting position, the lens is kept on the stretch by the purely physical character of its attachments to the choroid. As this stretch is exerted all round, the lens is kept flattened, particularly in its front aspect. When however focussing for near objects is desired, a special muscle called the CILIARY MUSCLE, which lies along the root of the iris, pulls on the choroid and draws it forward so that the tension on the lens is relieved and the lens, by virtue of its inherent elasticity, bulges, particularly on its front surface, becomes therefore more convex as a whole or, in ordinary parlance, becomes a stronger lens. This explains why focussing for near objects is recognised by us as requiring effort; when focussing for far objects we stop the action of the ciliary muscle and let the choroid, through its greater elastic pull, drag upon the lens margin. The range of focussing in the domestic animals is not nearly so wide nor is the mechanism as perfect as it is in man and the monkey. Behind the lens is a glairy but transparent fluid, the VITREOUS HUMOUR which fills up the greater part of the eyeball. In contact with the vitreous humour and sweeping round the inner wall of the eyeball as far as the lens attachment, is the very delicate RETINA which contains the receptors for light. The greater part of the retina does not belong at all to the peripheral nervous system; it is in reality a protrusion of the brain stem; the so-called optic "nerve" (second cranial nerve) which can be seen entering the eyeball and spreading out into the retina, being not a nerve trunk but a column of white matter belonging to the central nervous system. One of the many layers of the retina does however belong to the peripheral nervous system and this is the layer of "rods and cones" which consists of a mosaic of receptors for light attached each to an afferent neuron. At that point in the retina where the optic "nerve" with its attendant blood vessels enters, the layer of light-receptors is absent and so we have the well-known blind spot. In many portions of the retina the layer of rods and cones does not present an unbroken surface to the light, being traversed by blood vessels and nerve fibres, but in the centre and almost in a line with the pupil and the centre of the lens, the layer of receptors is free from superimposed blood vessels and on it the light can fall without any interruption.

The range of ether rhythms (red to violet) to which the retina is responsive is limited and is very small in comparison with the range of the air rhythms which can be perceived by the ear as sound. The mechanism by which colour is appreciated is not understood. According to one theory there are receptors for the three fundamental colours, red, green and violet, any intermediate colour being perceived by the unequal stimulation of two or all three of these. According to another theory certain colours including white, provoke chemical disintegration within certain receptors whilst other colours including black excite chemical building up in the same receptors.

Vision, it may be stated, presents a number of curious features such as *contrast phenomena, after images,* &c. in fact no sense organ can be so easily tricked as the eye. One important faculty which has a distinct significance is the power of the retina to adapt itself to feeble illuminations, being able, after a certain interval, to see with fair distinctiveness, objects which were at first hidden in darkness. Behind the retina in most domestic animals is a glistening coat, the TAPETUM, which reflects light and gives to the eyes of these animals a peculiar glare in low illuminations.

The eyes of all mammals present certain optical defects.

1. The system is not properly centred, that is, the centres of the cornea, the pupil, the lens and the retina do not lie in a straight line.

2. The curvature of the cornea, as also that of the lens, is not regular. Such a departure from the purely spherical means a distortion of the image on the retina. This defect is present in all eyes and is very marked in those of the lower animals whose vision must be far from perfect. To it the name *astigmatism* has been given.

3. A very common failing is *myopia*, or short-sightedness, due to the fact that the distance from the lens to the retina is too great and in consequence the image of a far object is focussed in front of the retina. This defect can be partly remedied in the human being by wearing concave glasses. It is very common in the lower animals and is often associated with marked astigmatism.

4. In *hypermetropia* the lens is too near the retina and objects at a distance require some focussing effort, whilst near objects cannot be seen clearly at all or only so by a violent action of the ciliary muscle. This is remedied in the human eye by wearing convex lenses.

The eyeball can move in its socket to a limited extent. Four small muscles, called *recti*, are attached to the outer surface of the sclerotic and, by their contraction, can turn the eyeball so that the cornea looks up, or down, or backwards, or forwards (outwards or inwards in man), or a combination of two of these. The eyeball can be rotated to a slight degree in a direction with or against the hands of a watch by two other small muscles called the *superior* and *inferior oblique;* by this movement the pupil can remain horizontal in whatever position the head is. Slight protrusion and retraction of the eyeball from the socket can occur in most animals through special muscles innervated by the thoracic autonomic.

II. THE EAR.—The ear in many respects is a mechanism superior to the eye. Owing to the qualities of the air-waves to which it responds the ear need not be directed towards the source of the sound. Moreover it has a greater analytic power, being able to distinguish two notes when sounding together, and has the faculty of recognising noises as well as musical tones. The external ear has some slight action in collecting the sound waves and in partially shielding the ear from all sounds except those to which the attention is directed. The sound waves enter the curved canal called the EXTERNAL AUDITORY MEATUS and then strike against a thin membrane, called the EAR DRUM, which completely separates the meatus from a chamber within called the TYMPANIC CAVITY. The ear drum is set in movement by the sound waves in much the same manner as the disc in a telephone receiver. To the inner or tympanic aspect of the drum is attached one end of a bridge consisting of three small bones (ossicles) which stretches across the tympanic cavity and conveys the vibrations of the drum to the wall on the opposite side. The tympanic cavity contains air which is in communication with the air in the upper part of the pharynx by means of a special air-pipe—the Eustachian tube. This tube, however, opens only in the act

of swallowing or yawning, but sufficiently often to equalise the pressure within and without the tympanic cavity and so to prevent the drum from being sucked inwards or bellied outwards. The actual organ of hearing is the COCHLEA, which is a bony structure bearing a striking resemblance to a snail's shell (Fig. 56). The spiral cavity however is not single as in the shell but divided, except at the extreme tip, by two partitions into three spiral canals—the *scala tympani*, the *scala vestibuli*, and the *canalis cochleæ* (Fig. 58). All these canals are filled with a watery fluid. The upper partition—Reissner's membrane—is very flimsy, but the lower one is made up of a strong shelf of bone from which a membrane—the BASILAR MEMBRANE—stretches to the opposite wall. This basilar membrane is composed of straight fibres which radiate out from the tip of the bony shelf. Perched on the basilar membrane, and continuing with it up the whorl, is the ORGAN OF CORTI of which no detailed description need be given here as so far its method of action has not been fully elucidated. It will be enough to state that the auditory nerve has its endings in the organ of Corti, which latter may be looked on as an array of sound-receptors.

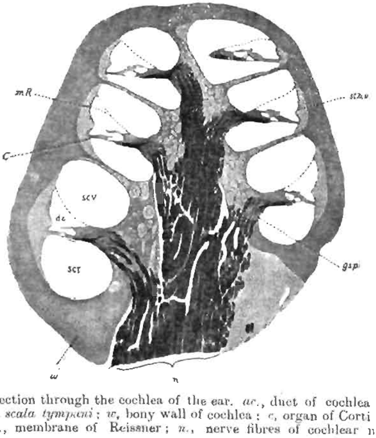


Fig. 58. Section through the cochlea of the ear. *ac.*, duct of cochlea ; *sc. v.*, *scala vestibuli* ; *sc. t. scala tympani* ; *w*, bony wall of cochlea ; *c*, organ of Corti on *membrana basilaris* ; *m.r.*, membrane of Reissner ; *n.*, nerve fibres of cochlear nerve. (After Sobotta.)

The vibrations of the ear drum are communicated to the bridge of ossicles described above. The other end of the bridge is fastened to an elastic window (Fig 56, 2) that shuts off the *scala vestibuli* from the tympanic cavity and so the vibrations are transmitted through this elastic window to the fluid in the *scala vestibuli*. The vibrations pass up this canal to the tip of the cochlea and then down the *scala tympani* and come to a halt at another elastic window which shuts off the lower end of the *scala tympani* (Fig. 56, 9). The vibrations therefore course above and below the

canalis cochleæ and set the fluid in this receptacle moving. The basilar membrane is affected by the movement and so causes a distortion of the organ of Corti and this causes stimulation of the sound-receptors.

The intimate connection that exists between the organ of hearing and the semi-circular canal system must serve some purpose but what it is has not as yet been discovered.

III. SMELL. The sense of smell is in so many ways connected with the selection of food that it is often classed with interoceptive sensations; but with the majority of animals other activities are guided by it. Thus the presence of enemies can be revealed; offspring can be recognised, and traced if strayed; vitiated air can often be recognised as such; whilst in the sexual life of most animals it plays a very important part. In man the delicacy of the sense of smell is greatly inferior to that existing in most other mammals, a decadence that may be due to the elevation of the head through the assumption of the erect posture. Yet even as it exists in man the sense of smell is many times more delicate, as a qualitative test, than the most refined methods of spectrum analysis. The receptors for smell are placed in a small yellowish patch of mucous membrane in each nasal passage. The fine afferent nerve fibres pass through the ethmoid bone into the skull and enter a special protrusion of the central nervous system called the olfactory bulb. The so-called olfactory "nerve" on each side (first cranial) is, like the optic nerve, a strand of white matter belonging to the brain stem. Substances which are perceived by the sense of smell are carried in the air in the form of gases, more rarely as matter in a finely divided state, and are first dissolved by the moisture covering the receptor patch of mucous membrane before the sensation is evoked.

PAIN RECEPTORS.—It is a matter of doubt whether a definite apparatus is necessary to start nerve impulses classified as painful. Some physiologists consider that a naked nerve-ending is sufficient. The significance of pain is that, at the spot where the impulses are inaugurated, the integrity of the living tissue is threatened by some destructive agency, such as extreme heat, cold or pressure, wounds, chemical corrosives, &c., on the skin, distension in the gut and heart, and inflammation in every region endowed with pain nerves. The receptors, or nerve endings, are constructed so as to respond to the change before the tissue is seriously impaired; the attention can therefore be directed to the abnormal part and an effort be made to remove the threatening agent, or to avoid further injury. Pain acts therefore like an alarm mechanism giving urgent warning that danger threatens and is indeed a most beneficent provision of nature. The skin and cornea are very rich in pain receptors which are frequently in action; the alimentary and muscular receptors are occasionally active, whilst those in the heart and other viscera may never start an impulse throughout a whole life-time. The regions of the body devoid of pain receptors are very few in number; those that may be mentioned are the outer layer of the skin, cartilage, the retina, and the central parts of the liver.

Visceral sensations not classifiable under the above headings arise in the urinary, genital and pulmonary organs. They are concerned with special functions of these organs when such are under any voluntary control.

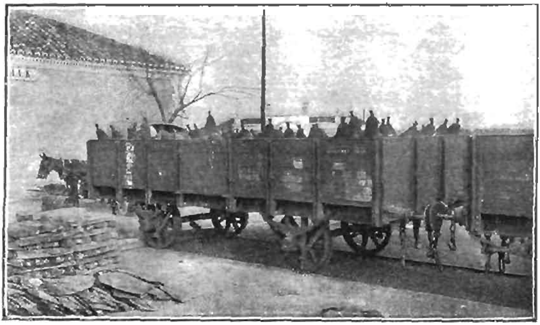
FIFTH PROGRESS REPORT ON VITICULTURE IN EUROPE.

(Continued from page 586.)

F. de Castella, Government Viticulturist.

Madrid and Navarra.

From Manzanares to Madrid is seventy miles, a journey which occupies about five hours in an ordinary train. The journey would be tedious if it were not rendered interesting by the strong local colour of all that meets the eye. Even the most common things leave no doubt as to the country one is in. Everything is distinctly Spanish and different to what one sees in other parts of Europe. Utensils and implements which have long been discarded in other countries are still in every-day use in Central Spain. At Argamasillia, for instance, where we stopped for a minute or two, is to be seen a truck-load of "botas," the large goat-skin vessels in which wine has been handled since biblical times. The snapshot called for by this unusual sight is here reproduced.



TRUCK LOAD OF "BOTAS" (SKINS OF WINE).

Though botas are not now used for the storage of wine, owing mainly to the taste they are apt to impart to it, they are still largely depended on for its transport, more especially in hilly districts on account of the facility with which they can be carried on pack mules. The method of manufacture is curious. After the hair is clipped short the skin is removed from the goat by means of a short cut across one haunch, the skin being turned inside out during the process. After being tanned, the hairy side, which now constitutes the inner side, is smeared with a resinous compound which renders it less penetrable by the wine; the legs and the section which permitted its removal are sewn up, and the neck is fitted with a special sort of screw stopper made of horn. Botas vary considerably in size; some frequently contain as much as 18 gallons of wine, such large ones costing

about 17 pesetas each (about 13s.). These curious vessels are mentioned as an example of the many strange features of this old fashioned and characteristic region.

Large areas of vines are occasionally seen; they are always short-pruned and trained gooseberry-fashion. These vineyards differ from those of Andalucia in being cultivated with the plough instead of by hand, mules being the usual traction animals. The chief wine varieties are Lairen or Airen, and Tinto Fino Cencibel, but several others are also grown, such as Albillo, Jaen, Moscatel, &c. As has already been explained phylloxera has not yet rendered necessary the reconstitution of this region. The poor land, of which much is to be seen, affords grazing for sheep and goats. Picturesque towns and villages are scattered here and there throughout the country which gradually becomes more hilly, but as the night closes in little is to be seen of picturesque Aranjuez, with its celebrated Royal palace. After a few hours Madrid is reached.

Madrid.

I was warmly received by the British Ambassador, Sir Maurice de Bunsen, to whom I presented my credentials the following morning. Sir Maurice had heard a great deal of Australian viticulture at the Paris Exhibition of 1889, and consequently was much interested in my mission. His reminiscences of this time interested me greatly, and brief reference to them are not out of place here. He remembered having assisted at the official dinner arranged by my father, the late Hubert de Castella, who was one of the Victorian Commissioners. At this dinner Victorian wines were served side by side with the choicest vintages of France. Sir Maurice was much struck by the favourable impression created, and described how M. de Blowitz, the well-known correspondent of the *Times*, stated, in the course of a short speech, that, though he was astonished at the audacity of the experiment he had just participated in, he was compelled to admit that it had resulted in success. These and similar occasions on which the high quality of Victorian wines has received recognition are apt to be lost sight of by the majority of consumers whose adverse criticism of our wines is unfortunately too often based on ignorance or prejudice.

Sir Maurice very kindly sent his commercial attaché, Mr. S. P. Cockerell, to introduce me to the Director of Agriculture, the Visconde de Eza. My visit to the Director in the magnificent offices of the "Fomento" was a revelation to me. From what I had already seen in Andalucia and La Mancha, I had come to the conclusion that in the work of reconstitution, Spanish growers were largely left to their own resources. Such was, perhaps, the case in the early days of the struggle with phylloxera, and it must be remembered that the viticultural centres of Andalucia have been reconstituted for a good many years. A brief chat with the Director, from whom I met with a charming reception, soon changed my views as to the way in which the State is aiding the growers. A great change is noticeable in the attitude of the State towards the growers, and in the provinces into which the pest has more recently found its way much good work is being done, and practical aid is being given with the result that in the northern and eastern provinces, reconstitution is now being actively proceeded with on sound and up-to-date lines.

After having inquired into wine making in Jerez and Malaga, and the dessert raisin industry at the latter place, as well as the shipments of fresh grapes from Almeria, I thought there remained little more for me to see

in Spain, and I anticipated returning to France after a brief visit to Valencia, where I wished to see something of the pudding raisin district. The Visconde de Eza explained to me that I had as yet seen but little of the viticulture of his country, and that the most interesting part of Spain, so far as reconstitution is concerned, was as yet unknown to me. He urged me more particularly to visit Pamplona, the capital of Navarra, in the extreme north of Spain; the adjoining viticultural district of La Rioja; Valencia; and also Villafranca del Panades, near Barcelona. He very kindly gave me letters to the directors of the Government viticultural stations in these four centres.

A brief description of reconstitution in Navarra, and some of the leading features of the interesting district of La Rioja, forms the subject of the present report. Before proceeding to these places I had an opportunity of visiting the central agricultural institute in Madrid, known as the Escuela Especial de Ingenieros Agronomos, where students qualify for the degree of Ingeniero Agronomo (agricultural engineer), the course having a duration of six years. The institute is situated at Moncloa, a suburb of Madrid. It occupies the site of a pottery factory, at one time somewhat famous. At the time of my visit the school was closed for the Christmas vacation and extensive alterations and improvements were being made to various branches, the chemical laboratories in particular were being much improved and enlarged. I was shown over the buildings by the principal, Don Antonio Botija y Fojardo. Adjoining them are the experimental plots, occupying some 90 acres of land. In close proximity to the school is the Granja, or experimental farm of the Government, which, though a separate institution, is run to some extent in conjunction with it so as to give students the benefit of practical work on a large scale. The Granja consists of nearly 1,800 acres of land devoted to mixed farming. Some portions of it are irrigable, though in the high cold situation of Madrid such is not indispensable. It contains collections of the more important vine varieties grown in Spain, and plots where experiments are conducted as to manuring, and different systems of training and cultivation. As phylloxera is as yet unknown in the neighbourhood of Madrid little was to be learnt in connexion with reconstitution in this interesting establishment, which bears witness to the practical interest the Spanish Government now take in agricultural education and experimental work

Navarra.

From Madrid I proceeded to Pamplona, the capital of the old kingdom of Navarra. Navarra is situated right in the north of Spain, on the French frontier, and near the junction of the coast lines of Western France and Northern Spain. A good part of the province, consisting of high mountains, is too cool for the growth of the vine. I carried a letter from the Visconde de Eza to Don Nicolas Garcia de Los Salmones the director of the agricultural service of the province. Don Nicolas is well known outside of Spain, especially in France, as he has frequently acted as one of the Spanish representatives at viticultural conventions in different parts of Europe. M. Couderc had given me a letter to him when I passed through France some four months earlier, and this I was also able to present to him. I cannot speak in sufficiently high terms of the reception I met with at Pamplona, nor could I thank Don Nicolas enough for his kindness to me personally, and for the large amount of valuable information he so freely placed at my disposal. Of his high qualification it is

scarcely necessary for me to speak here. The high esteem in which he is held in official circles in his own country has led to his being charged with important missions in different parts of Spain in connexion with reconstitution. He is one of the fathers of Spanish reconstitution, and I found him to be one of the most interesting men I had the good fortune to meet during my varied journeys. He is at present carrying out two viticultural investigations of the greatest importance, not only to the province to which he is officially attached, but to the viticultural industry generally. One is the compilation of a viticultural soil map of the whole ot Spain, which has entailed an enormous amount of travelling and the collection and analysis of several thousand soil samples. This work is now approaching completion and will be awaited with interest by students of viticulture generally. Another work of great national importance on which he is engaged is the collection and identification of all the different varieties of vines cultivated in Spain—the establishment of a Spanish ampelography, in other words. He has already collected about 1,000 varieties cultivated under different names in different parts of the country. He anticipates that several of these will turn out to be varieties cultivated under different local names in different districts, and that the verification of these synonyms will reduce the number considerably. Nevertheless it is evident that a very large number of distinct varieties peculiar to Spain exist; probably several hundred, apart from the different grafting stocks and direct producers of recent creation.

The confusion existing in Victoria as regards the different varieties of vines we cultivate, and the names by which they are generally known, makes the initiation of a similar work highly desirable. Similar confusion appears to exist throughout the Commonwealth. It is not limited to Victoria.

From Madrid to Pamplona, the capital, one takes the Barcelona train as far as Casetas, the station before Zaragoza, changing to a line to the French frontier, which remounts the course of the River Ebro as far as Castejon, at which place it bifurcates, one branch taking the Navarra route, whilst the other follows the course of the river *viâ* the district of La Rioja. Pamplona was my first objective. The night journey from Madrid to Casetas deprives one of a view of the scenery in that part of the country. Day dawned shortly after changing trains, enabling one to see the picturesque valley of the Ebro. This remarkable river cleaves a deep furrow right across Spain in an almost straight line parallel with, but longer than the Pyrenees, from its mouth near Tarragona to its source in the Basque country, north of Burgos. This part of the journey is exceedingly picturesque, as is also the more mountainous portion met with after leaving the river at Castejon; one is taken up amongst hills which rise higher and higher, and are here and there covered with snow. Many picturesque villages and towns are passed, among the most striking of which are Tafalla, with its citadel on a high hill, and Olite, the ancient capital of Navarra, the remarkable palace of which, no doubt a royal palace in the time of Henri IV. of France and Navarra, is now in a sadly ruinous state.

Pamplona is at length reached, a prosperous town of some 30,000 inhabitants, which was in olden times strongly fortified—moats and drawbridges still remain as mementoes of the pâst, and bear witness to the historic part this interesting town played in the frequent wars in which Navarra participated. As a result of some of these the province was granted, and enjoys to this day, a special system of self-government. The Government

is directed by an Assembly, known as the Diputacion Foral y Provincial de Navarra, usually referred to as the Diputacion. The agricultural branch is under the direction of Don Nicolas Garcia de Los Salmones. Pamplona being up among the Pyrenees is right out of the region of the olive, though a few thousand acres are planted in Southern Navarra. North of Pamplona it is too cold and bleak even for the vine. In the southern portion, viticulture is one of the most important forms of agriculture. About the centre mixed farming is the rule, much wheat and sugar-beet being grown. Vines are grown almost exclusively for wine, the usual type of which being *vin ordinaire*, selling at a cheap rate, for Navarra does not boast of any celebrated wines. This wine is rather lighter than that produced in the adjoining districts.

It is more than twelve years since phylloxera found its way into the province, which was officially declared to be "phylloxerated" in 1896. The Diputacion realized the serious nature of the trouble, and actively assisted growers in the task of reconstitution, supplying them with resistant vines at a cheap rate, and giving them the most reliable and most recent information on the subject. Large plantations of mother vines were made; grafting classes were established; and those growers who replanted on resistant stocks were freed from taxation for a period of six years. To this generous assistance is no doubt due the rapid progress of reconstitution. It has also stimulated other districts in the same direction. The active assistance received by growers in the north and east of Spain is in striking contrast to the way they were left to their own resources in Andalucia.

The province of Navarra affords an object lesson in reconstitution which should be of interest to Victorians at the present time, as replantation on resistant stocks is at the present moment being actively carried out under the direction of one of the leading viticultural authorities of the day. A few figures as to the extent of the viticultural industry, the provisions made to assist growers, the demand for resistant stocks and the supplies available, will be interesting. In 1889, or before the appearance of phylloxera, Navarra possessed 115,567 acres under vines, yielding 23,000,000 gallons, or nearly 200 gallons to the acre. At the end of 1906 the area under vines was only 19,706 acres, which yielded in that season, which was a fair one, 1,883,000 gallons, or less than 100 gallons to the acre, this small yield being no doubt accounted for by the number of vines not in full bearing. The Diputacion owns 600,000 mother vines, from which it distributed last season 20,000,000 rooted vines—(barbados)—and cuttings, though the total number applied for amounted to 50,000,000. Don Nicolas informed me that some trouble has been caused through applications being received from speculators who wished to resell cuttings, sometimes outside of the province. He has had to frame stringent regulations to prevent this practice.

The active way in which reconstitution is being pushed on, and the increasing demand is shown by comparing the above figures with those for 1904, in which year the applications received, and quantities available were as follows:—

	Applications.	Quantities available.
Nursery cuttings ...	9,158,900	7,143,426
Cuttings fit to graft ...	6,029,050	2,815,056
Barbados	3,717,650	714,639

The prices charged last season were as follows per 1,000 plants:—

	Pesetas.	English equivalent at par. £ s. d.
Nursery cuttings 20 inches long ...	8	0 6 5
Grafting cuttings 18 inches long ...	15	0 12 0
Barbados 20 inches long ...	35	1 8 0
Grafted rootlings 18 inches long ..	150	6 0 0

The quantity of grafted rootlings available for distribution is small, however, and Don Nicolas is gradually ceasing to produce them. Though at first the Diputacion considered it necessary to supply these to growers, and a few years back planted in a nursery as many as 1,000,000 grafted cuttings in one season, Don Nicolas has urged them to discontinue grafting. In his opinion, it is no more the function of the Government to graft a grower's vines for him than it is to prune his vineyard. He considers that, with the supplying of grafting wood and demonstrational and experimental work to show the best course to be pursued, the duty of the

VIGNERON REMOVING RESISTANT CUTTINGS.

State should end. Excellent work has been, and is still being done in these directions. Grafting classes to train men to carry out the work were freely held, at the conclusions of which certificates were granted to those who proved themselves to be proficient. Growers have thus been educated in the production of grafted rootlings, and the work is undertaken also by nurserymen in the province, so that the carrying out of the work by the State is less necessary than it is with us. Experimental work also is being actively carried out, there being no less than forty experimental plots, of which seventeen are regional plots, on land belonging to the State, the balance being on private properties.

The mother vine plantations number twenty-six, and are scattered all over vine growing portions of the province in order to save vinegrowers as much inconvenience as possible. They together contain nearly 500 acres of mother vines, the average size of each being about 20 acres, though the size varies considerably, the largest containing over 50 acres, whilst the

smallest is under an acre. They are thus enabled to call at a plantation in their immediate neighbourhood for such cuttings as they may require. A small grower taking some of his purchases home from the Government plantation at Sartaguda on a small pack donkey is here illustrated. This system of localization presents the further advantage of enabling growers to obtain their supplies in fresh condition. As soon as they are removed from the vines, the cuttings are kept fresh by having their bases placed in running water in large open trenches; a little brushwood or straw thrown over the top protects them from the direct sunlight.

Climate and Soil.

The climate of Pamplona is cold and wet. The southern part of the province, where it borders on the River Ebro, is however sufficiently mild to permit of olive culture, which occupies some 20,000 acres. The entire produce is made into oil, of which nearly 700,000 gallons were made in 1906. The trees are usually planted at from 25 x 25 ft. to 32 x 32 ft. apart; the principal varieties grown being Vidreal, Empeltre, Acebuche and Negral. In a general way the climate is considerably colder than that of Andalucia and La Mancha.

From a geological point of view, Navarra presents much variety, especially in the mountainous northern portion where primary formations and a little granite, intermixed with that of secondary age, chiefly of the Cretaceous period, are to be found. The vine-growing portion is however, mainly tertiary—miocene in the extreme south, and eocene in the more central portion, whilst in the valleys are smaller areas of alluvial soils, recently deposited, in which the vine grows well. The high lime contents of the tertiary soils, so largely represented, have caused some trouble so far as adaptation is concerned, as soils containing from 35 to 50 per cent. of carbonate of lime are not uncommon. In such soils, the older stocks fail to give satisfaction. Berlandieri hybrids and Franco-Americans now play a large part in the reconstitution of the Province, as shall be shown presently. Don Nicolas is naturally an authority on questions of Agricultural Geology. He was much interested in the Geological map of Victoria which I had brought with me, and with the aid of which I was able to give him a better idea as to the nature and constitution of the soils with which we have to deal. He was struck by the preponderance of soils of primary geological age, and of more recent ones resulting from their decomposition. Such soils are comparatively rare in Spain, and are mainly confined to the high mountain ranges. With few exceptions, the wine-growing districts are rich in lime in secondary and tertiary formations. I was particularly anxious to study reconstitution in soils as similar as possible to our own, but this fundamental difference between the geological ages of the two countries rendered this a matter of some difficulty, soils similar to ours being hard to find. Don Nicolas was well qualified to assist me in the matter, as the great soil survey he is engaged on has made him familiar with the whole of his country. He advised me to visit the extreme north-east of Spain where, near Figueras, in the Province of Gerona, the Pyrenees fall away to the Mediterranean. It was there, in his opinion, that I would find vines cultivated in soils geologically similar to our own. He very kindly gave me letters of introduction. It was from him that I learnt which of our soils are likely to prove the most difficult in the way of adaptation. These are the stiff limeless clays, containing much silica in a fine state of division, which

set hard after rain and do not crack. Such soils, which are of frequent occurrence in some parts of Victoria, are the ones in which he considers we are likely to have adaptation troubles with American vines. In our other soils freedom from excess of lime will give us a distinct advantage.

Varieties Cultivated, Pruning, Training, etc.

The principal variety cultivated is the Garnacha or Garnacho, which appears to be identical with the Grenache of Southern France. The popularity this variety enjoys in Northern and Eastern Spain is in strong contrast to the small esteem in which it is held in Victoria, and renders it probable that the two varieties are not identical. In Navarra, the wine made from this vine is of a light type, owing to the climate being cool, but in warmer parts it yields full bodied wines. The so-called "Tarragona" ports, for example, so largely shipped to England, are almost exclusively made from this grape. In addition one finds several other red varieties in Navarra, chief amongst which are Mazuelo, which is none other than the Carignane of Southern France. Monastrell or Monastel, identical with the French Morastel, and several varieties peculiar to Spain, chief among which are Tempranillo and Graciano, two varieties which more properly belong to the adjoining district of La Rioja where they are extensively grown. Several other local sorts of less importance are also to be found. The usual distance between the vines is 6 ft. 6 in. x 6 ft. 6 in., cultivation being executed with the plough, though in some localities the vineyards are entirely worked by hand; owing to the cool climate the soil is less deeply worked than in Southern Spain. The winter cultivation or Cava is executed to a depth of 6 in.; the two summer cultures known as Hedras are quite shallow. The vines are not staked or tied up in any way and remind one strongly so far as training is concerned of those of Southern France.

Near Marcilla I visited a vineyard named El Raso De San José which had a year or two previously taken a prize as one of the best kept vineyards in the district. It was planted on a stiff, rather greasy, clay soil, and was chiefly composed of Garnacho and Tempranillo grafted on A.R.G.1. and Rupestris du Lot. The cellars were equipped with modern appliances. Fermentation is conducted in closed vats as at Bordeaux, the stalks being entirely removed. At Marcilla I also visited a very large sugar mill employing 250 workmen and capable of dealing with 450 tons of beetroot per day. It was anticipated, at the time of my visit, that 40,000 tons would be treated during the season.

Establishment of Vineyards.

Subsoiling is the rule before planting; it is carried out to a depth of about 2 feet. In Navarra, the plantation of nursery raised bench grafts is becoming very general. It is to a considerable extent displacing the older method of field grafting, which was formerly alone used. Opinions differ greatly among growers as to which system is to be preferred. As I have previously pointed out, the question seems to be mainly one of climate. The colder this is the less readily do grafts knit, and consequently the greater the percentage of failures with field grafting. Then again, in a cold climate the unions, owing to less abundant vegetation, are not so perfect as they are in a warm climate where the rapid growth, once the graft has knitted, results in a completely satisfactory union. I discussed the subject at considerable length with Don Nicolas, who prefers the bench graft, especially in the cooler portions, though he admits having

seen excellent results obtained by field grafting wherever the spring was sufficiently warm. In his opinion the field graft comes into bearing sooner, and for the first few years bears heavier crops, but the bench graft eventually overtakes it. In some Navarra vineyards the summer bud graft or "Yema," similar to that described in connexion with Jerez, (see 4th Report) has given good results. Near Olite a large vineyard was entirely grafted by this method, the unions obtained being very perfect.

PRINCIPAL RESISTANT STOCKS.

The popularity of the different stocks shows itself clearly in the plantations of mother vines which exist in the province. At the close of 1904 these were as follows:—

No.	Botanical Origin	No. of Mother Vines.
420 A	V. Berlandieri × V. Riparia	120,861
157–11	" "	23,526
34 E	" "	9,225
	Rupestris du Lot	37,928
3309	V. Riparia × V. Rupestris	69,494
3306	" "	4,078
101–14	" "	13,618
1202	Mourvedre × V. Rupestris	62,234
1203	" "	16,798
A.R.G 1	Aramon × Rupestris Ganzin	48,930
A.R.G 9	" " "	46,991
41 B	Chasselas × Berlandieri	36,704
84–3	Complex hybrid (Couderc)	22,000
106–8	V. Riparia × Cordifolia Rupestris	19,277
219 A	V. Rupestris × V. Berlandieri	7,231
301 A	" "	6,276

These were the official figures in 1904. There were smaller quantities of a few other stocks, bringing the total number of mother vines up to nearly 600,000, covering an area of 468 acres.

The total number and acreage have not sensibly changed since that date, though some alterations have been made by grafting, in order to make the quantities of each stock available agree better with the demand, or in other words with their popularity. For example, 420A, though an excellent and very popular stock, appears to have been planted somewhat in excess of requirements. Of the 120,000 originally planted, a considerable number have recently been converted by grafting to A.R.G.9 and 1202, which are exceedingly popular in Northern Spain. It may be here noted that Berlandieri hybrids are not always as popular at first as their remarkable qualities would lead one to anticipate, probably on account of their slightly slower growth in their earlier years. 3309 has also been reduced in numbers by grafting, the high lime contents of the soil of Navarra rendering it unsuitable for the Riparia x Rupestris group in the great majority of cases. Don Nicolas is inclined to prefer 3306 to 3309, especially in stiffer soils. In his opinion 101-14 is the least valuable of the three.

Very striking is the popularity of the Franco-American or Vinifera-American group, especially 1202, A.R.G.1, A.R.G.9 and 41B. The sufficiency of their resistance to Phylloxera has already been dealt with at length (see 4th Report, p. 353). Their power of supporting lime renders them of special value in Navarra.

The above figures are of interest as they give some idea of the number of mother stocks required to supply resistant cuttings for the reconstitution of a given area. It is highly improbable that Victorian plantations will be

on so considerable a scale as that on which replantations are being made in Navarra, and allowance must be made for the fact that a good deal of the wood raised in that province finds its way into other parts of Spain. It is, nevertheless, evident that a considerable quantity of American wood will be required before we shall have accomplished the reconstitution of anything like our present area. Want of time prevented my visiting more than two of the numerous experimental stations and nurseries in the province. These were Olaz-Chipi and Sartaguda, to both of which Don Nicolas accompanied me. These two establishments differ widely in their situations and functions. A summary description of them will give some idea of these and of other kindred institutions in the province.

Olaz-Chipi Experimental Station.

This is rather an experimental station than a nursery; though it possesses 20 acres planted with mother vines, the greater part of it is occupied by collections. It may be looked upon as the head-quarters' station being situated at about half-an-hour's drive from the gates of Pamplona. It is here that the 1,000 Spanish varieties collected by Don Nicolas are being ampelographically studied. In addition to this important work several experiments are being conducted. One of a rather curious nature, the results of which are in apparent contradiction to the recognised laws governing agricultural methods, merits brief description.

The experiment was instituted in order to test the need for cultivating the soil. On several plots of vines the surface of the soil was completely covered to a depth of 6 inches with clinker. In this layer, weeds do not grow, nor is it cultivated or disturbed in any way. The vines were 4 years old when covered with clinker, but before the original plantation, the soil had, as is usual in the province, been trenched 2 feet deep. The experiment has now been in progress five years, and though no cultivation of any kind has been given during this time, each season the yield, both of grapes and of canes removed at pruning, has been higher on these clinkered plots than on the control plots alongside which are cultivated in the ordinary way. Similar experiments have recently been conducted in several parts of France. The subject is important, and one which will be referred to at length in a later report. It is as well to bear in mind the difference between the cold, wet climate of Pamplona, and that of Northern Victoria. To see in the curious results of such experiments a justification for neglect of cultivation in our dry, warm districts where the roots must be kept in the lower layers of the soil would be, to say the least, most injudicious.

At Olaz-Chipi the question of direct bearers, the new hybrid vines which may, it is hoped, enable grafting to be dispensed with, is receiving considerable attention, and the most promising of the new creations are being methodically studied.

Though the wine made from these grapes is usually very inferior to that yielded by the old European varieties, I was considerably astonished at that made from M. Couderc's hybrid No. 3907, which was a nice light dry red of claret type with much better bouquet that one usually finds in the wine of these vines. This wine was 4 years old, and would therefore appear to improve with age, a character not shared by the majority of direct bearer wines. Another vintage of the same grape (1906) was not quite so good, though fuller bodied. If vintaged too ripe the difference between these grapes and the old European varieties seems to be accentuated. No. 3907 has resisted Phylloxera in a satisfactory manner at

Pamplona where it has been cultivated for ten years. This vine seems to merit further study. Several other direct bearers seem to give promise, notably Nos. 126-21, 28-112, J503, of Couderc; 3-917, and 13-317 of Castel; and 1, 2, 14, 156, &c., of Seibel.

SARTAGUDA NURSERY.

Sartaguda is mainly a nursery and plantation of mother vines for wood production. It is one of the principal Viveras de Region (regional nurseries) which are owned and worked by the Diputacion, or central government of the province as distinguished from the local nurseries, which are under the control of the shire councils, or, Ayuntamientos as they are called in Spanish. Viticulture is such an important industry in this part of Spain that the shire councils have actively intervened and are materially assisting growers, especially in the way of supplying grafting wood. The nursery is situated in sandy soil on the left bank of the Ebro, just across the river from the wayside railway station of Lodosa on the line from Castejon to Logroño. The picturesque old village of Sartaguda shown in the photo. here reproduced stands on a hill above the nursery. It is typical of the small villages so common in this part of Spain where, until recently,

VILLAGE OF SARTAGUDA.

the land-holders found it necessary to associate for mutual defence and live together in small communities instead of making their homes on the land they worked. The soil at the nursery is sandy, and reminded me strongly of that at the new nursery at Wahgunyah. Don Nicolas was rather dissatisfied with it at first, and feared this land would not prove rich enough for the production of the large supplies of wood he required. It has, however, exceeded his anticipations, as the 50 acres under mother vines produced last season 5,000,000 cuttings of which 60 per cent. were fit for bench grafting. The balance are planted in the nursery to be sold later as *barbados* or sold direct to growers who strike them in their own nurseries. It is true that they were manured and irrigated; the manure consisting of a dressing of about 4 cwt. of superphosphate and 1 cwt. of sulphate of ammonia per acre every third or fourth year. Irrigation is judiciously practised, no water being given after midsummer in order not to interfere with the proper ripening of the wood. With proper attention to this point, irrigation does not appear to in any way reduce the quality of the wood for grafting. The pruning of the mother vines was somewhat different in Navarra to what I had seen in other parts. Instead of all shoots being cut off flush with the old wood (osier or "tête de saule" system) short spurs are left. It is claimed that in this way the vines last longer. With the exceedingly short pruning usually practised the crown or head

swells up continually and the centre of it after a while dies off. This is particularly noticeable in the case of Rupestris du Lot. At the time of my visit (3/1/98) gangs of men and women—principally the latter—were hard at work removing the wood from the vines, cutting them into suitable lengths—45 centimetres, or about 18 inches, is the length universally adopted, for cuttings to be bench grafted those to be struck in the nursery ungrafted are cut 50 cm. long—and making them into bundles.

I assisted at the trial of a machine by which cuttings could be made and automatically counted. The inventor, an electrician employed in the neighbouring electric power works, who had recently patented it, objected to my photographing his machine which I saw a few weeks later at the large nurseries of Don Jaime Sabaté the well-known nurseryman at Villafranca del Panades near Barcelona who eventually purchased the patent.

PRESERVATION OF CUTTINGS.

The need for such a machine proves the extent of the trade now being done in resistant cuttings. A photograph of one of the preservation trenches in which cuttings are placed, with their butts in *running* water, immediately after their removal from the vines gives a good idea of it also.

Don Nicolas has found it necessary to take stringent measures to prevent wood being purchased, at the cheap rate at which it is supplied to growers, for resale outside of the province in other parts of Spain where less ample provision has been made for supplying the demand for resistant cuttings necessary for reconstitution.

* * * * * *

Such is a very brief description of the present state of the viticultural industry in the province of Navarra. I could with advantage have spent some weeks in studying reconstitution under such capable and energetic management but want of time rendered this impossible. I saw enough however to be highly impressed with the good work now being done by the Government which is in such marked contrast to the entire absence of State aid in the first destroyed provinces of Southern Spain.

Artificial Manures Acts.

LIST SHOWING RESULTS OF ANALYSES OF SAMPLES OF ARTIFICIAL MANURES COLLECTED IN THE STATE OF VICTORIA UNDER THE PROVISIONS OF THE ARTIFICIAL MANURES ACTS.

Label No.	Official No.	Description of Manure.	Manufacturer or Importer.	Moisture.	Phosphoric Acid.								Average Net Weight Found.	Net Weight Guaranteed.	Estimated Value per Ton.
					Water Soluble.		Citrate Soluble.		Insoluble.		Total.				
					Found.	Guaranteed.	Found.	Guaranteed.	Found.	Guaranteed.	Found.	Guaranteed.			
				%	%	%	%	%	%	%	%	%	lbs.	lbs.	£ s. d.
356	21675	Superphosphate, "Federal"	Aust. Explosives and Chemical Coy., Melbourne	5.13	17.15	17.00	3.74	1.00	1.06	2.00	21.95	20.00	218	224	4 17 6
369	21685	" "	" " " " "	9.51	17.01	17.00	1.79	1.00	1.38	2.00	20.18	20.00	*	224	4 9 3
393	21735	" "	" " " " "	7.96	15.29	17.00	2.40	1.00	2.63	2.00	20.32	20.00	*	224	4 4 10
405	21754	" "	" " " " "	10.26	16.35	17.00	1.36	1.00	2.77	2.00	20.48	20.00	220	224	4 5 10
360	21671	Superphosphate, No. 1	Colonial Manures Coy., Melbourne	10.03	17.14	17.00	1.50	1.00	1.51	2.00	20.15	20.00	*	224	4 8 11
390	21703	" "	" " " "	10.21	17.63	17.00	1.52	1.00	1.57	2.00	20.72	20.00	227	224	4 11 5
432	21772	" "	" " " "	7.16	16.64	17.00	1.72	1.00	2.26	2.00	20.62	20.00	*	224	4 8 1
346	21658	Superphosphate, "Florida"	Cuming, Smith, and Coy., Melbourne	9.34	17.78	17.00	1.96	1.00	2.85	2.00	22.59	20.00	224	224	4 15 1
359	21670	" "	" " " "	10.69	17.57	17.00	1.56	1.00	1.87	2.00	21.00	20.00	222	224	4 11 6
365	21678	" "	" " " "	11.25	17.42	17.00	1.20	1.00	3.47	2.00	22.09	20.00	222	224	4 11 1
366	21679	" "	" " " "	11.16	17.50	17.00	1.34	1.00	3.04	2.00	21.88	20.00	224	224	4 11 7
370	21681	" "	" " " "	9.38	17.95	17.00	1.34	1.00	2.39	2.00	21.68	20.00	*	224	4 13 0
372	21683	" "	" " " "	10.97	17.68	17.00	1.48	1.00	4.05	2.00	23.21	20.00	*	224	4 14 0
375	21688	" "	" " " "	10.85	16.95	17.00	1.24	1.00	4.08	2.00	22.27	20.00	*	224	4 9 7
385	21699	" "	" " " "	11.92	19.02	17.00	1.35	1.00	2.29	2.00	22.66	20.00	*	224	4 18 0
394	21736	" "	" " " "	12.15	17.28	17.00	1.32	1.00	2.59	2.00	21.19	20.00	*	112	4 9 11
395	21737	" "	" " " "	11.50	16.44	17.00	1.28	1.00	3.76	2.00	21.48	20.00	*	224	4 6 11
402	21745	" "	" " " "	11.50	18.10	17.00	1.18	1.00	2.55	2.00	21.83	20.00	224	224	4 13 3
422	21764	" "	" " " "	10.18	16.36	17.00	1.61	1.00	3.04	2.00	21.01	20.00	*	224	4 7 2
423	21765	" "	" " " "	7.07	16.58	17.00	0.93	1.00	3.18	2.00	20.69	20.00	*	224	4 5 8
427	21769	" "	" " " "	11.38	17.72	17.00	0.75	1.00	2.47	2.00	20.94	20.00	*	224	4 9 8
358	21662	Superphosphate, Soluble	A. H. Hasell, Melbourne	11.43	16.83	18.00	2.24	1.00	..	1.00	19.07	20.00	*	224	4 8 11
430	21773	" "	" " "	13.09	18.18	18.00	1.82	1.00	0.19	1.00	20.19	20.00	*	224	4 13 9
376	21689	Superphosphate, No. 1	Mt. Lyell M. and R. Coy., Melbourne	6.91	15.91	17.00	2.81	1.00	2.81	2.00	21.53	20.00	*	224	4 9 7
379	21692	" "	" " " "	8.85	18.54	17.00	1.46	1.00	1.98	2.00	21.98	20.00	*	224	4 15 11
398	21744	" "	" " " "	9.19	16.31	17.00	1.90	1.00	2.42	2.00	20.63	20.00	224	224	4 7 6
425	21767	" "	" " " "	10.31	18.16	17.00	0.92	1.00	1.83	2.00	20.91	20.00	*	224	4 11 9
426	21768	" "	" " " "	10.64	15.47	17.00	2.20	1.00	2.52	2.00	20.19	20.00	*	224	4 4 10
450	21788	" "	" " " "	7.57	17.30	17.00	1.87	1.00	1.02	2.00	20.19	20.00	*	224	4 10 8
387	21702	"	P. Rohs, Bendigo	10.18	12.98	17.52	1.73	2.50	0.36	..	15.07	20.02	*	224	3 8 11

Label No.	Official No.	Description of Manure.	Manufacturer or Importer.	Moisture.	Water Soluble Found.	Water Soluble Guaranteed.	Citrate Soluble Found.	Citrate Soluble Guaranteed.	Insoluble Found.	Insoluble Guaranteed.	Total Found.	Total Guaranteed.	Average Net Weight Found.	Net Weight Guaranteed.	Estimated Value per ton.
347	21666	Superphosphate, No. 1 Standard Flag Brand	Renard Fertilizer Coy., Melbourne	10.93	16.89	17.00	1.38	1.00	1.51	2.00	19.78	20.00	223	224	4 7 3
357	21661	,, ,, ,,	,, ,, ,, ,, ...	8.27	16.99	17.00	2.44	1.00	1.63	2.00	21.06	20.00	220	224	4 12 1
391	21704	,, ,, ,,	,, ,, ,, ,, ...	7.14	16.42	17.00	1.74	1.00	1.63	2.00	19.79	20.00	219	224	4 6 7
345	21665	Superphosphate, No. 1 ..	Wischer and Co., Melbourne	6.45	16.85	17.00	2.00	1.00	2.52	2.00	21.37	20.00	220	224	4 10 6
386	21700	,, ,, ..	,, ,, ,, ...	9.77	18.17	17.00	1.23	1.00	2.74	2.00	22.14	20.00	*	224	4 14 0
397	21739	,, ,, ..	,, ,, ,, ...	8.55	16.76	17.00	1.08	1.00	2.10	2.00	19.94	20.00	224	224	4 6 0
407	21756	,, ,, ..	,, ,, ,, ...	12.35	18.30	17.00	0.73	1.00	1.24	2.00	20.27	20.00	226	224	4 11 1
424	21766	,, ,, ..	,, ,, ,, ...	11.61	17.95	17.00	0.76	1.00	2.48	2.00	21.19	20.00	*	224	4 10 9
437	21779	,, ,, ..	,, ,, ,, ...	8.56	15.90	17.00	1.52	1.00	3.42	2.00	20.84	20.00	*	224	4 5 0
449	21787	,, ,, ..	,, ,, ,, ...	6.02	17.30	17.00	1.06	1.00	2.37	2.00	20.73	20.00	*	224	4 8 9
367	21680	,, ,, ..	,, ,, ,, ...	6.17	16.92	17.00	1.46	1.00	2.35	2.00	20.73	20.00	215	224	4 8 6

* Not weighed.

Label No.	Official No.	Description of Manure.	Manufacturer or Importer.	Moisture.	Nitrogen. Found.	Nitrogen. Guaranteed.	Phosphoric Acid. Water Soluble. Found.	Water Soluble. Guaranteed.	Citrate Soluble. Found.	Citrate Soluble. Guaranteed.	Insoluble. Found.	Insoluble. Guaranteed.	Total. Found.	Total. Guaranteed.	Average Net Weight Found.	Net Weight Guaranteed.	Estimated Value per ton.
				%	%	%	%	%	%	%	%	%	%	%	lbs.	lbs.	£ s. d.
384	21697	Bone and Superphosphate	Aust. Explosives and Chemical Coy., Melbourne	4.70	0.87	1.00	8.25	12.00	6.19	0.50	3.18	7.00	17.62	19.50	*	224	4 4 5
448	21786	Dissolved Bones ..	Cuming, Smith, and Co., Melb. ..	10.39	0.98	1.00	9.25	10.01	4.34	3.88	8.61	5.48	22.20	19.37	*	224	5 1 11
374	21687	Bone and Superphosphate	,, ,, ,, ,, ..	9.36	1.39	1.50	6.33	8.50	10.28	0.50	5.31	10.00	21.92	19.00	*	224	5 4 8
378	21691	,, ,,	Mt. Lyell M. and R. Coy., Melb.	7.00	1.55	1.50	9.21	8.50	4.96	1.50	5.59	9.00	19.76	19.00	*	224	4 19 10
380	21693	,, ,,	,, ,, ,, ,, ..	7.41	1.46	1.50	7.11	8.50	6.62	1.50	5.28	9.00	19.01	19.00	*	224	4 14 5
383	21696	,, ,,	Renard Fertilizer Coy., Melb. ..	7.00	1.81	1.50	7.08	8.50	6.42	0.50	6.39	10.00	19.89	19.00	222	224	5 1 1

* Not weighed.

LIST SHOWING RESULTS OF ANALYSES OF SAMPLES OF ARTIFICIAL MANURES, ETC.—*continued.*

Label No.	Official No.	Description of Manure.	Manufacturer or Importer.	Moisture.	Nitrogen. Found.	Nitrogen. Guaranteed.	Phosphoric Acid. Found.	Phosphoric Acid. Guaranteed.	Mechanical Condition. Fine. Found.	Mechanical Condition. Fine. Guaranteed.	Mechanical Condition. Coarse. Found.	Mechanical Condition. Coarse. Guaranteed.	Average Net Weight Found.	Net Weight Guaranteed.	Estimated Value per ton.
				%	%	%	%	%	%	%	%	%	lbs.	lbs.	£ s. d.
440	21785	Bonedust and Blood ..	W. Angliss and Co., Footscray ..	20.02	5.21	5.60	13.50	15.01	15.00	34	85.00	66.00	*	224	4 19 10
459	21790	" " ..	" " ..	9.41	6.00	5.60	14.40	15.01	30.50	34	69.50	66.00	*	224	5 14 2
445	21784	Bonedust	H. J. Feore and Co., Richmond ..	14.03	2.85	2.43	14.53	16.28	33.00	..	67.00	..	*	224	4 2 8
456	21789	"	E. T. Hoskin, Bairnsdale ..	8.61	4.05	3.65	21.34	20.22	28.00	37.60	72.00	62.40	*	224	5 19 0
436	21775	"	E. A. Kleiner, Wangaratta ..	7.41	4.30	3.86	21.73	21.66	23.00	20.60	77.00	70.40	*	224	6 1 10
382	21695	"	Milo Bacon Coy., Echuca ..	6.34	4.63	..	16.10	..	50.50	..	49.50	..	225	..	5 10 3
388	21698	"	Renard Fertilizer Coy., Melb. ..	4.10	8.90	4.00	18.52	18.50	31.50	45.00	68.50	55.00	222	224	5 7 10
381	21694	"	Mt. Lyell M. and R. Coy., Melb. ..	6.19	3.54	3.00	17.94	18.00	36.50	38.00	63.50	62.00	*	224	5 2 11
439	21780	"	A. W. Redman, Brunswick ..	14.17	2.31	2.72	9.46	10.61	38.00	45.75	62.00	54.25	*	112	2 19 1
441	21781	"	" " " ..	15.16	2.72	2.72	14.56	10.61	35.00	45.75	65.00	54.25	*	112	4 1 9

* Not weighed.

P. RANKIN SCOTT,
Acting Chemist for Agriculture.

Government Laboratory,
Melbourne, 23rd October, 1908.

GARDEN NOTES.

J. Cronin, Principal, School of Horticulture, Burnley.

Hardy Shrubs.

The general term, hardy shrub, is applicable to plants with woody stems, whose stature, when fully developed, does not exceed twelve or fifteen feet, with a low and branching habit of growth, and a constitution that enables them to resist extremes of heat and cold. Shrubs are divided into two classes, viz., evergreen—those that retain their foliage during the whole year; and deciduous—those that are devoid of leaves during the winter months. In each class many kinds are included that are practically indispensable in a collection of garden plants, as they supply, in addition to a floral or foliage effect at certain periods, a protection or background to more tender or dwarfer plants. Flowering shrubs as the Magnolia, Oleander and others have been specially referred to in these "notes," and the purpose of this short article is to briefly refer to additional kinds that are suitable to the ordinary gardening conditions obtaining in the greater part of the State and which can be obtained at a reasonable cost in any of the principal nurseries. Most of the deciduous shrubs generally cultivated are found to thrive best in cool, loamy soils, and are suitable for planting in districts south of the Dividing Range; while many evergreens require a light, warm soil and considerable heat to attain perfection. Many shrubs native to various parts of Australia are worthy of much more attention than they commonly receive, and are easily grown in comparatively poor and unmanured soil.

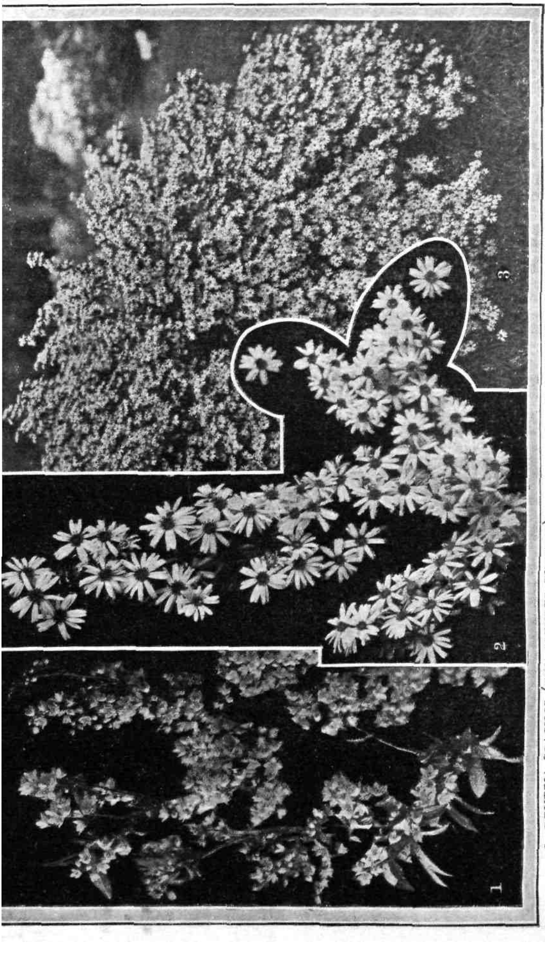
A well-drained and fairly porous soil is suitable for most of the plants recommended below. The soil should be properly prepared and, if necessary, be manured before the plants are set out, so that when once established there will be no occasion for root disturbance. Planting from pots may be done at any time during the growing season. Spring and autumn months are generally considered the most suitable periods for the work, but if a supply of water is available, planting may be done throughout summer, avoiding very hot and windy days, and shading the plants for a time if necessary. Deciduous shrubs are usually transplanted from the open ground during the winter months. The best time to do so is when the leaves are falling in autumn, as the plants recover from the check consequent on transplanting before spring, and are fairly established before the hot summer weather begins.

During the first growing season, at least, the plants will probably require some care in watering, training, &c.; cultivation of the soil and mulching around the plants will assist them, except in the case of the Australian plants which resent the application of manure and thrive better when the surface is only lightly worked.

Desirable Kinds for Small Gardens.

Shrubs that eventually attain a height of from three to six feet are most suitable for planting in small places, and in larger gardens for planting in the foreground of extensive borders or groups.

Choisya ternata is one of the best of the spring blooming evergreen shrubs, producing quantities of white flowers, sweetly perfumed, the foliage being deep green and shining and the plant quite hardy.



1. DEUTZIA GRACILIS (THE SLENDER DEUTZIA). 2. FLOWERING SHOOT OF FELICIA ANGUSTIFOLIA.
3. FELICIA ANGUSTIFOLIA (THE PURPLE DAISY BUSH).

Felicia angustifolia is also a spring blooming kind, producing a mass of purplish daisy-like flowers. The plant rarely exceeds a height of three feet.

Diosma alba, the African sleet bush, is a dwarf hardy plant, the flowers being white, and the foliage being sweetly scented. This plant is often called the white Boronia.

Genista Andreana is one of the finest of the broom-like plants, the flowers being freely produced, and crimson and yellow in colour.

Berberis Darwinii is a beautiful shrub, the flowers being bright orange in colour, and freely produced during the winter months. This shrub thrives best in cool districts.

Othonna Athanasiæ produces bright yellow flowers, resembling the marguerite, during the winter months, and is hardy and easily grown.

Hypericum Moserianum is also a yellow flowered dwarf plant, very attractive in bloom.

Eriostemon neriifolium is a very pretty shrub, the flowers being white, star shaped, and borne in great profusion.

Lasiandra macrantha grandiflora is one of the finest, producing large flowers of a bright violet-purple colour during autumn.

Prostranthera Sieberi, the Mint Bush, bears a mass of light violet coloured blooms in spring, and is one of the Australian plants that resent manure or root interference.

Boronia megastigma is one of the most popular of dwarf shrubs, the flowers being copper-coloured, and deliciously fragrant. Boronia thrives best in a new and unmanured soil in the cooler districts of the State.

Kerria Japonica is a hardy deciduous shrub, the bright yellow flowers being produced in early spring. A double flowered form is more popular than the ordinary type.

Pyrus Japonica is a well known winter blooming plant, the flowers being scarlet and produced prior to the leaves. A white and a pink form of this plant is also procurable, and the whole are very easily grown and worthy of cultivation.

A glance at a nurseryman's catalogue will reveal the fact that numerous shrubs of various classes are procurable, and that to refer, even briefly, to the most important would require a deal of space. To mention a few in addition to those above noted that are worthy of cultivation for their flowers or foliage may be sufficient for an intending planter, viz.: Rhus succedanea Sambucus aurea, Prunus purpurea, Melianthus major, Weigelia rosea and many varieties, Spiræas, various, Polygala grandis, Euonymus Japonicus variegatus, Garrvælliptica, Hydrangeas, various, Gardenia florida, Hakea suaveolens, Grevilleas, various, Acacias, various, Coprosma Baueriana variegata, Deutzias, various, Daphne indica rubra, Chorizema cordata, Arbutus unedo, Cantua dependens, Clethra arborea, Viburnum opulis and plicatum, Callistemons, various, Protea mellifera.

Flower Garden.

The present season has been favorable to growth generally, and with fair attention to cultivation of the soil and suppression of insects and fungi, an abundant supply of flowers should be assured during the spring and early summer months.

Cultivators of cactus dahlias for exhibition are usually anxious to learn something regarding the "novelties" offered for sale by the nursery trade. A number of new varieties are imported annually from various

sources, and usually include a few kinds that are superior to some of the older favorites. Last season the following kinds were exhibited by the importers, and promise to be worthy of inclusion in the best collections :— "Kathleen Bryant," a fine rich velvety crimson; "Loveliness," white tipped heliotrope, a very pretty combination of colour; "Caradoc," a very fine yellow variety; "Rev. Arthur Hall," a large flower with very narrow florets of a bright ruby crimson shade; "E. Cadman," Indian red; "J. C. Newbury," dark wine crimson; "Mrs. W. H. Raby," creamy white, and "Hyacinth" yellow shading to pink. Two Victorian raised varieties, "Conference," petals red, tipped white, and "Bundoora" orange red, were among the finest seen last autumn.

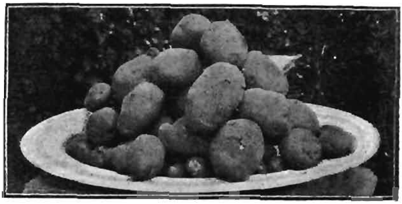
Herbaceous plants require a fair supply of moisture to enable them to produce fine flowers. Many kinds as perennial Phlox and others will be benefited by a top dressing of a rapid acting fertiliser, which should be lightly worked into the soil and well watered. A mulch of manure will materially assist the flowering in addition to keeping weeds under.

Seeds of tender annuals may be sown, and plants from former sowings transplanted. If the plants are carefully removed during cool days, or in the evening, and watered, very little check is likely to follow the removal.

Kitchen Garden.

The moist weather has favored growth of plants and weeds, and the latter must be rigidly and promptly suppressed, or the plants will suffer. The free and frequent use of the hoe, Planet Junr., or other cultivator is a most important operation at this season. Plants should be thinned out to allow sufficient room for fair development of those that are to remain. A liberal thinning and careful selection of healthy typical plants is certain to largely increase the yield of most vegetables if grown under fair conditions.

Ground should be prepared for the reception of succession crops of French beans, peas and other vegetables.



THE ORCHARD.

James Lang, Harcourt.

There have been splendid falls of rain all over the State during the past month, and crops of all kinds have greatly benefited. Fruit trees have bloomed most profusely, and all kinds seem to be setting well. It is astonishing how rapidly the bloom opened on all kinds of apples during the few hot days experienced; nearly all varieties opened within a few days of each other. The London Pippin, Annie Elizabeth, and Reinette du Canada were the last to bloom. Although the trees were in bloom only a short time the fruit is setting for very heavy crops; apples and pears especially give promise of record crops all over the State. Should this anticipation prove to be correct a very large proportion of the crop will have to be exported to oversea markets, so that a remunerative price may be obtained in local markets for the balance.

Weeds are now growing apace, and the scarifier should be kept at work to keep them down; this also prevents the ground from becoming caked, as after rain, if not stirred up it soon becomes hard and dry, and the moisture soon evaporates.

Young grafts will have to be looked over the ties, being cut and secured to stakes to prevent them being blown off. Spraying for codlin moth will take up a good deal of the orchardist's time during the month. In spraying, keep up a strong pressure from the pump, and spray each tree thoroughly so that it may be effective. An American authority recommends only one spraying given at a very high pressure just after the petals have dropped from the flower; he maintains that if this is properly done, no other spraying is necessary. This is not in accord with the experience of most of our leading orchardists who spray from six to ten times during the season. If the young grubs from the first brood all entered the apple from the eye, this might be so, but the hatching of the first brood extends over a lengthened period. The writer caught the first moth this season on the 10th October, and they will be hatching out every day till about the first week in January—a period of three months. Close observation has shown that the grubs which are hatched late enter the apple from the side, therefore to rely on only one spraying would be to court failure in effectively destroying the grub. Spraying, to be effective, should be done at intervals of not more than fourteen days right through the growing season, and if carefully done not more than 5 per cent. of the fruit should be affected with the moth.

Finish bandaging the trees this month. Newly planted trees should be looked over and all young shoots not wanted to form the tree should be rubbed off. If peach trees are affected with the curl in the leaf spray with Bordeaux mixture. Apple trees affected with the woolly aphis should be dressed with the sulphur potash remedy previously recommended.

BRACKEN AND ITS BINDING EFFECT ON LOOSE, SANDY, COASTAL SOILS.

Alfred J. Ewart, D.Sc., Ph.D., F.L.S., Government Botanist.

After having tried several methods of eradication a Gippsland correspondent writes to say, that he has come to the conclusion that the method recommended by the Department of deep cultivation, pulling all the rhizomes out on the surface with a "cultivator" is the cheapest and best. It is found, however, that exposed sandy coastal soils, after such thorough cultivation, commence to drift about with every strong gale of wind in spring and summer; this causes him to ask whether the reason bracken is so plentiful on loose sandy coastal soils, is that nature intended it to make and bind these soils.

That bracken binds the sandy soils on which it grows on the coast and prevents them drifting is undoubted. If such soils are to be cultivated it should be done in the form of strips, care being taken that no great breadth is broken up at one time. If each strip, after cultivation, is seeded down with strong grasses and drought resistant clovers such as the birds-foot trefoil, the less strongly scented forms of Melilotus, &c., there should be no danger of drifting. The planting of hedges (Tea-tree, Acacia, Tree lucerne, Tagasaste, &c.), or clumps or belts of trees would be of great use as breakwinds. Natural timber should on no account be destroyed.

To say that nature intended bracken to play the part of binding these soils, otherwise it would not be there, is to beg the question. Nature intended dodder to grow on lucerne, mistletoe on forest-trees, and thistles on pastures, but man interferes. In the case under discussion bracken can be replaced by humus forming plants, such as clover, &c., by sand-binding grasses, as Psamma, Cynodon, Elymus, &c.; and by sheltering the soil by trees and hedges, thus reclaiming a good deal of land for pasture and some for permanent cultivation without any danger of loss. Wherever man interferes with nature by substituting one plant for another care must always be taken to see that the balance of nature is restored in a manner suitable to the changed conditions. For instance, if a sand-binding plant is replaced by more useful ones which do not bind sand so well, the balance must be restored by the use of break-winds of some kind or other.

THE JOURNAL

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The Department of Agriculture.

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FIFTH PROGRESS REPORT ON VITICULTURE IN EUROPE.

(Continued from page 695.)

F. de Castella, Government Viticulturist.

La Rioja and Aragon.

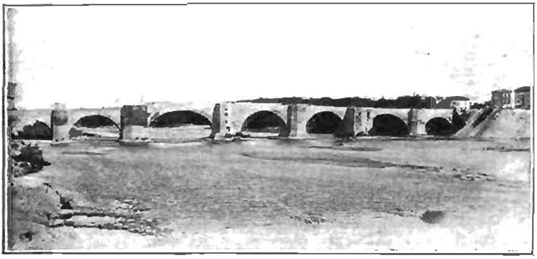
South-west of Navarra, across the river Ebro lies the district known as La Rioja. It is not a legislative or administrational subdivision, but a region which from an agricultural, and more especially a viticultural stand-point, has a distinctive character of its own. It is further subdivided into Rioja Alta; on the right bank of the Ebro, west of Logrono; Rioja Baja on the right bank of the same river east of Logrono; and Rioja Alavesa on the opposite bank and forming part of the province of Alava in the Basque country. The two first-named subdivisions constitute the riverside portion of the province of Logroño in Old Castille. It is only in this milder part that vines are much grown, for the southern half of the province is mountainous, rising in places to an altitude of 7,500 feet above sea level.

La Rioja is usually bracketed with the adjoining region (ancient kingdom) of Aragon in official publications; together they make up a very important group of viticultural districts which may be best described as that of the upper Ebro valley. This region in 1889 possessed no less than 547,778 acres under vines which yielded in that year the enormous quantity of 88,628,760 gallons of wine or nearly one-seventh of the total wine yield of Spain.

In 1906 this area had fallen, according to official statistics, to 400,000 acres yielding only 35,302,388 gallons of wine, this large reduction in yield being brought about by the ravages of phylloxera which found its way into La Rioja in 1890 and more recently into Aragon. Want of time rendered it impossible for me to study viticultural problems in Aragon; besides, reconstitution is not yet sufficiently advanced for it to constitute an important field for inquiry. It is a region which

produced in enormous quantities the blending wines so largely shipped to France a few years ago to make good the deficiency in the wine supply of that country caused by phylloxera.

These wines, produced largely from the Garnacho or Grenache, the Carignane (here called Mazuelo), the Morastel (Monastrel), and several purely Spanish varieties such as Miguel de Arco and some others less widely grown, are big heavy wines, rich in colour and tannin and of an alcoholic strength of about 22 to 23 per cent. of proof spirit. The cessation of the French demand, owing to increased production following on reconstitution, has been a severe blow to Aragon winegrowers who have experienced a crisis similar to that recently gone through in Southern France. However, decreasing production, owing to the continued spread of phylloxera in Spain, is relieving the pressure and as phylloxera works havoc in portions of the country which have hitherto been free from it, prices will no doubt improve. Reconstitution is commencing and will ere long be in full swing in Aragon.



BRIDGE OVER THE EBRO AT ZARAGOZA.

The wines of La Rioja are very different from those of Aragon and enjoy an excellent reputation throughout Spain where the name of the district has become synonymous with what is best in the way of light dry red table wine—La Rioja is in fact the claret district of Spain. When one wants something better than the "Vin ordinaire" provided free of charge at lunch or dinner at all Spanish hotels and restaurants, it is almost always a bottle of Rioja that is ordered. The English term claret is often appropriated and by many firms this wine is labelled Rioja Clarete, the final "e" of the second word being pronounced. Some thirty or forty years ago the best wines of the district were found to be somewhat similar to those of Bordeaux and a few energetic growers and merchants imported trained cellarmen from that celebrated French wine centre with the result that the natural product was greatly improved—so much so that it has almost entirely superseded French clarets in Spain.

In 1892 the Spanish Government established a viticultural station at Haro which has been of great assistance to growers generally and has further contributed to the improvement of this the best table wine in Spain.

I was able to visit the district having several letters of introduction and, in addition, Don Nicolas Garcia de Los Salmones most kindly

offered to accompany me from Sartaguda in his own district and to introduce me personally to his colleague Don Victor Cruz Manso de Zúñiga y Enrile, the Government Viticulturist for the agricultural region of Aragon and Rioja and Director of the Estación Enológica de Haro. Don Victor proved to be another charming Spaniard and one of the leading viticulturists in his country his special branch being wine making in connexion with which he is one of the leading authorities in Spain to-day.

The two principal wine centres in La Rioja are Logroño and Haro, the former in Rioja Baja, the latter in Rioja Alta. They are both on the Ebro and easily accessible by the railway line which follows that river. The Ebro is one of the most picturesque rivers in Spain—it is spanned here and there by old fashioned stone bridges a photograph of one of which, at Zaragoza, the old capital of the once Kingdom of Aragon, is here reproduced. The craggy hills to be seen in close proximity to the river are often crowned by old watch towers and sometimes by imposing castles, usually in a more or less ruinous condition though from a distance they still present an imposing appearance and bring vividly to one's mind the frequent conflicts which have taken place in this part of Spain which for many hundred years has practically been one huge battlefield with but brief periods of peace. Large villages with quaint but handsome churches of great antiquity standing out as their most striking feature are also met with at short intervals, another proof of troublous times in which isolated buildings or even hamlets, afforded scant security to life. The view which unfolds itself as the train winds along might easily be a series of scenes in a theatre and one feels inclined to ask if scenic artists have not found many of their originals in this remarkable part of Spain.

Viewed from a practical stand-point this region is still deeply interesting, its geology, for one thing, being striking and varied. In the distance one sees high mountains usually of Secondary age often belonging to the Cretaceous period, whilst the foot hills near the river are usually of Tertiary age though the formations most frequently to be met with vary a good deal. In Rioja Alta the Aquitanian formation occurs very frequently, the hillocks of characteristic soft sandstone rock alternating with patches of good free soil very often gravelly and reminding one of the Alpine Diluvium of Southern France though occasionally stiffer soils are to be found. In Rioja Baja the Minocene formation is more largely represented, the curious flat topped hillocks, like the roof of a house, which are characteristic of this formation, being a striking feature of the landscape.

The importance of viticulture in La Rioja and the amount of havoc wrought by phylloxera prompt me to quote a few statistics. In 1889 the Province of Logroño (which includes the greater portion of La Rioja) possessed 125,740 acres under vines which yielded 20,747,232 gallons of wine. Phylloxera was first discovered in the province in 1890; in 1906 its ravages had reduced the area under vines to 92,400 acres* and the wine yield to 4,210,492 gallons or less than one-fifth of the yield in pre-phylloxera days.

The district is now in full reconstitution, the quality of the wines produced enabling remunerative prices to be relied on. Wines of exactly

* This area is probably excessive; it includes many vineyards, which have practically gone out of cultivation, though not yet eradicated.

similar type do not seem to be procurable elsewhere in the country and the scarcity of Rioja wines is much complained of and acts as a powerful stimulus to reconstitution. Though very agreeable table wines they did not strike me as being so similar to the wines of Bordeaux as I was frequently told; they are shorter lived wines, coming to maturity earlier and not lasting so long as French clarets. They remind one a good deal of our Australian clarets though they are rather lighter, their alcohol strength seldom exceeding 20 per cent. of proof spirit.

The soils are very suitable for viticulture and appear to give rather less trouble as regards excess of lime than those of Navarra for which reason no doubt the Riparia Rupestris hybrids are more popular than in that province—3309 is the one usually preferred. In the more limey soils the stocks most frequently met with are the Berlandieri hybrids 420 A and B, 157-11, 34 E and the Franco-Vinifera hybrids 1202, A.R.G. 1, A.R.G. 9 and 41 B. The stocks used are in fact much the same as those employed in Navarra and as regards reconstitution generally there does not appear to be very much difference between the two provinces. Subsoiling is carried out to a depth of 2 feet as a rule and, as in Navarra, field grafting is much less popular than in Southern Spain, no doubt owing to frequent failure of the graft through cold weather in spring.

It is the quality of the wine and the way it is made which renders La Rioja chiefly interesting and for this reason the varieties used as scions deserve mention rather than the stocks. Such sorts as Garnacho, Mazuelo and Monastrel are so widely known under the corresponding French names of Grenache, Carignane and Morastel as to render further description unnecessary, but in La Rioja one finds several varieties, little known out of Spain, which appear to contribute to the quality of the wine of the region and which therefore merit brief reference. These are the red varieties Tempranillo, Graciano and Miguel de Arco and among white sorts Malvasia, Viura, Calagraño, Turruntès and Maturana as well as a variety of Muscat known as Moscatel de la Tierra, a small round berried kind which yields an excellent Muscat wine known as "Supurado" the best of which comes from the village of Labastida in La Rioja Alavesa. In addition to these the Bordeaux varieties, Cabernet Sauvignon, Merlot and Malbeck, have been introduced from France and are to be found cultivated on a fairly large scale in conjunction with the old kinds of the district in several of the best vineyards. Tempranillo is, as its name indicates, an early ripening variety whch plays a very considerable part in the region, entering in the proportion of often as much as 50 per cent. into the composition of the Rioja "Claretes." It is a vigorous growing variety of spreading habit and a fairly heavy bearer. Graciano is a late variety which appears to be indigenous to the district. It is usually looked upon as the quality element in the best red wines of the region.

These varieties are certainly worthy of a trial in Victoria for they produce really excellent wines. The best Bordeaux "cepages" have not displaced them in the Rioja vineyards where both have been cultivated for many years side by side. When one remembers the restricted area which in Europe often proves most suitable for one particular kind of vine it is highly probable that we will in some localities, at any rate, find some variety, or varieties, more profitable to cultivate than our Shiraz which at present appears to be the general favorite red grape

from the Yarra to the Murray. That we have reached a higher standard of excellence with our white than with our red wines is a fact which is patent to all wine judges. It is one which should cause us to experiment with other red sorts and amongst these the choice red varieties of La Rioja are perhaps the most interesting ones which I met with in Spain.

The winery system is very prevalent in La Rioja, growers usually selling their grapes to the winery which is generally a large company. Several of these are to be found in the towns of Logroño and Haro. They make, mature and bottle the wine under their own name and not under that of the vineyard on which the grapes were grown. The price usually paid for grapes varies between 16 and 20 pesetas per 100 kilos (£6 8s. to £8 per ton reckoning the peseta at par) but growers are fairly independent. The winery system being of comparatively recent introduction, they still nearly all have their own crushing and fermenting plants. If the price offered for grapes falls below £6 per ton they prefer to make their own wine.

LOGRONO.

I arrived at Logroño, the chief centre of La Rioja Baja and capital of the province, in company with Don Nicolas de Los Salmones by the evening train on 3rd January, 1908. We spent next morning in visiting the fine Bodega Franco Española just over the river from the town. This fine winery is the largest in Logroño. As everything is conducted on practically the same lines as in Bordeaux cellars, detailed description is unnecessary. A large trade in wine appears to be done with the South American republics, judging from the number of casks I saw ready to leave for Buenos Ayres, Colon, and Panama. Those for the last two places were painted outside with green arsenical paint, this treatment being necessary to guard against perforation by a borer which abounds on the Isthmus. The red wines which were very nice light dry table wines were made from Tempranillo 50 per cent. and Grenache and Graciano 25 per cent. each. The wine is usually kept two to three years before it is bottled during which time it is frequently racked. The hogsheads are always stored "bonde de côte" (bung on one side) exactly as in the Bordeaux cellars, and the wine is seldom allowed to remain more than four months without racking. This frequent handling no doubt brings it on rapidly but Don Nicolas seems to think they have gone to the extreme of handling rather too much and that the wines of this part would be better if less frequently exposed to the air. Some very good white wines were also shown to me chiefly of the Chablis and Sauternes types made from the white varieties referred to above.

In conjunction with the Bodega a large nursery is run, in which many thousand bench grafted cuttings are struck. The grafting is done with a Roy machine, the shouldered cleft being preferred to the mitre graft. The earlier grafts are callused in sand but the later ones are planted direct from the machine.

HARO.

On the 4th January I reached Haro, the chief town in La Rioja Alta and the most important wine centre in the region, the wines made in its neighbourhood being somewhat lighter than those of Logroño which tend rather more in the direction of the big blending wines of Aragon. Though quite a small town, the population not exceeding 6,000, it is prosperous, well built and very picturesque (see photograph). Its prosperity is entirely

due to its wine trade, for it is the chief supplier of good table wines to the whole of Spain.

I presented a letter of introduction to Don Arturo Marcellino, one of the leading wine merchants of the town, who very kindly drove me out to see one of the most important vineyards in the neighbourhood owned by Don L. Etcheverra. Zaco was the name of the vineyard we visited. Together with Paceta, across the river and belonging to the same proprietor, it constitutes an estate of several hundred acres.

Zaco is planted on gently rising land the soil being an excellent one, a deep rich, free, loam containing a large proportion of waterworn pebbles. As the percentage of carbonate of lime only amounts to 10 or 12 per cent. adaptation has given little trouble; 3,309 is largely used as stock and is giving excellent results. As regards scions, the Tempranillo variety preponderates, about one-half of the vines being of this sort. One-third consists of Graciano, the balance being made up with white sorts chiefly Malvasia and Calagraño. The admixture of a small quantity of white grapes is held to be an advantage here, as is the case also in the Hermitage district of France, the object being to increase the "finesse" of the wine. The vines are planted at 6 x 6 feet, short pruned and trained gooseberry

VIEW IN THE TOWN OF HARO.

bush fashion with rather low crowns. Cultivation is done by animal traction—horses and mules. At the time of my visit the first winter ploughing was in progress. Single furrow French ploughs with one mule harnessed in shafts were being used, the soil turning up in beautiful order to a depth of 6 or 7 inches. In this climate, which is cooler and moister than that of Southern Spain, the ground is not turned over to such a considerable depth. This vineyard is typical of the majority of those in the region. Don L. Etcheverra's fine bodegas, adjoining the Haro railway station, were next visited. It is here that the grapes grown at Zaco and Paceta are made into wine as well as large quantities of bought grapes grown by small vineyard owners, the selling of the grapes to large wineries being the general rule. The usual price paid last vintage (1907) was two pesetas per arroba of 11½ kilogrammes which would work out at over £8 per ton reckoning the peseta at par.

I next visited the large bodegas of the Compania Vinicola del Norte de España which may be taken as typical of the numerous wineries and maturing cellars of the region. As has already been pointed out, Rioja

wine-making methods are based on the Bordeaux system, the only important difference between the two being the length of time the wine is allowed to ferment on the skins. At Haro eight to twelve days is the rule, whilst at Bordeaux twenty to thirty days is the usual time. The same hermetically sealed fermenting vats are employed and removal of stalks or "desgranar," as it is termed in Spanish, is usually practised—at any rate in the large wineries. When small growers make their own wine they still frequently ferment with the stalks.

The fermenting room at the Compania Vinicola contained twelve large, closed fermenting vats, of a capacity of from 3,300 to 5,500 gallons each. When racking off the vats the "first run" is kept separate from the press wine, the latter being sold separately as inferior. The machinery on this establishment is quite modern, a good deal of it being of French make (from Bordeaux). Amongst other things that struck me was a centrifugal must pump capable of conveying 10 tons of crushed grapes per hour.

The storage cellars remind one even more strongly of Bordeaux than the winery. Here everything is conducted on exactly similar lines, which is, however, not surprising as the head cellarman in all the Haro cellars is almost invariably a Frenchman.

One is shown into the same long galleries in which the wine is stored exclusively in hogsheads of 50 gallons capacity, piled in tiers, three and four high and kept in absolute darkness. The same rather moist air which causes the growth of a peculiar form of fungus and the same even temperature were observable. At the time of my visit racking was commencing, in the old-fashioned style, with the bellows instead of the pump. With wine stored in hogsheads the amount of handling involved can be easily understood. Full details of the methods followed in these cellars will be found in a subsequent report in which Bordeaux methods will be dealt with.

In these cellars the stock of wine amounted to 14,000 hogsheads or nearly three-quarters of a million gallons of wine. A large pasteuriser of the "Pastor" make was also shown to me, but I was informed that it is not now employed—a statement which was probably prompted by the foolish prejudice existing in so many quarters against pasteurisation. No doubt the light wines of Haro easily ferment out dry and therefore give little trouble in the way of secondary fermentations, but nevertheless the pasteuriser I saw appeared to me as though it were pretty often worked.

Several fine wines chiefly of the Claret type were shown to me, especially a very fine young one of 1906 vintage containing 20 per cent. proof spirit. I also saw some nice white wines chiefly of Sauternes and Chablis types as well as a sparkling wine of good quality. The prices charged for these wines in Spain by the dozen and in bulk may prove of interest, those quoted me by the Compania Vinicola were as follows:—

	Per Dozen.	Per Gallon (Hogshead quantities).
Red Wines.	s. d.	s. d.
RIOJA CLARETE—		
Vintage 1903 ...	14 6	—
,, 1904 ...	12 0	3 2
,, 1905 ...	9 6	2 8
White Wines.		
RIOJA—		
Vintage 1902 ...	16 0	4 9
,, 1903 ...	14 6	4 0
Sparkling Wine.		
RIOJA ESPUMOSO (Champagne) ...	32 0	—

Another remarkable wine establishment I visited was the bodegas of Lopez Heredia y Cia who have a stock of eleven or twelve thousand hogsheads or over half a million gallons of wine. The storage cellars include a very long tunnel of large diameter excavated in the solid rock. The plant is most efficient and up to date, including a must pump and a "Roy" continuous press. The machinery is driven by a 14 h.p. steam engine.

The hogsheads used are chiefly made of American oak. Though Bosnia oak is considered superior, it is becoming hard to get and is being superseded by the cheaper wood. These casks are merely steamed, washed and sulphured in the ordinary way no special preparation being applied to them.

THE VITICULTURAL STATION.

The Estación Enológica is an important institution which serves as another proof of the interest the Spanish Government is now taking in the encouragement of agriculture and of the practical aid it is giving growers in connection with viticulture. Run in conjunction with it are experimental plots and collections near the town, but the most important portion consists of the station itself with its experimental cellars and well equipped laboratory where students are trained and research work in connexion with wine making is carried out and analyses are made for growers according to a reasonable tariff as witness the following prices for a few items:—

Determination of alcohol by distillation	2 pesetas
" " ebullioscope	1 "
" dry extract by enobarometer	1.50 "
" " " evaporation	2.50 "
" grape sugar by density	1 "
" " " chemical method ...	4 "
Wine analysis (alcohol, extract, ash, acid, gypsum, and intensity of colour)	8 "
" " fuller	18 "
" " complete	75 "

(Peseta is worth about 10d. at par.)

The old buildings having been found inadequate for the purpose new quarters have recently been erected. These are nearing completion and when thoroughly equipped will be capable of accommodating 50 students. The building alone cost £1,800 but when fully equipped with plant and residence for staff, &c., it will cost four or five times this amount. The Director was unfortunately absent at the time of my visit as also was his second in command, the Marques de la Solana, but I was shown over the buildings by another member of the staff, Señor Estefana. In La Rioja state assistance is limited to experimental and demonstrational work. The supplying of resistant cuttings is left to private nurserymen of whom there are many in the region. Students at the Estación qualify for diplomas of competency as expert cellarman or as vineyard overseer (capataz).

EL CIEGO.

Don Victor Manso de Zúñiga, the director of the viticultural station, returned to Haro late on the Saturday night. On my being introduced to him he very kindly proposed to take me to see the celebrated vineyard of El Ciego on the following day. This vineyard is the property of the Marques De Riscal who was one of the first proprietors to introduce Bordeaux methods into La Rioja, as far back as the year 1862. His

wines are known throughout Spain as amongst the best table wines produced in the country.

El Ciego is situated some 40 miles from Haro, further down the Ebro and on the other side of it in La Rioja Alavesa. We took Sunday morning's train for, as in other Continental countries, Spanish trains run on Sundays the same as on week days. The village of Briones with its curious church tower and the huge square 16th century donjon of Dabalillo, across the river, are among the most striking land marks in this very picturesque region. Olives are to be seen here and there but only in irregular plantations for we are here on the climatic limit of the olive zone in Spain. Don Victor points out to me the celebrated vineyard of La Salmuera de San Vincente situated on a rise in the bend of the Ebro, the soil being free and gravelly. This wine, made from the Tempranillo and Garnachio grapes, is fuller bodied than most Rioja wines, containing as much as 24 per cent. of proof spirit. The Garnachio variety is exceedingly susceptible to phylloxera and succumbed far more rapidly than the other kinds grown in this neighbourhood.

A "TARTANA"—A TYPICAL SPANISH VEHICLE.

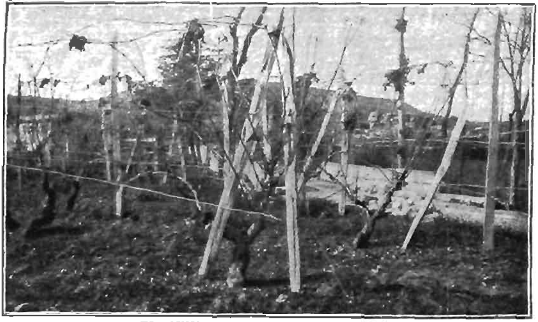
Near here I remarked a curious mode of subsoiling being carried out on a small field destined to become a vineyard. The gin or winding drum driven by a horseworks was fixed in one corner of the field from which the furrows radiated fan-like instead of being, as usual, parallel. This method, which is common about here, renders it unnecessary to shift the winding plant. It appears to give satisfactory results and is no doubt a better system than the partial subsoiling sometimes also practised. The wide open trenches, which will be refilled when the vines are planted, are occasionally to be seen from the train.

We also pass the property of Don Victor's brother, the Conde de Hervias, a distinguished Spanish artillery officer, whose handsome residence the Torre de Montalbo, a 10th century castle in excellent preservation, is situated near where the small river Najerilla joins the Ebro. At Cenicero we quit the train, have almuerzo (the Spanish equivalent of lunch) at the small fonda near the station and hire a tartana to take us to El Ciego, some 7 miles distant across the Ebro. Tartanas are the usual mode of locomotion in this part of Spain; they are light, easy running

and comfortable enough provided the road is good for they have no springs. On the average Spanish roads an Australian buggy would be far preferable. A photograph of our tartana is reproduced.

CELLARS OF MARQUIS DE RISCAL AT EL CIEGO.

Before crossing the handsome new bridge over the river we come across more subsoiling, for this part of the country is in full reconstitution. It is being done with winding gins driven by six mules. This time the furrows are parallel as in France. The soil is being trenched to a depth of 2 feet, the subsoil being brought to the surface. When I tell Don Victor that in Victoria we expect to get our subsoiling done for 50s. per acre* he expresses astonishment; he says it costs at least twice this sum in Spain.



TRAINING OF VINES AT EL CIEGO.

El Ciego is a prosperous village which strikes one at a distance by its imposing and characteristic church. Its most important institution

* This was the price at which contracts were being let prior to my departure.

however is the cellars of the Marques de Riscal, the object of our visit, the large establishment which provides work for most of its inhabitants. The exterior of the cellars (see photograph) does not give anything like an idea of its importance, for most of it consists of vaulted galleries covered over with earth. As at Haro one would immediately imagine one self at Bordeaux in any of these long, dark vaults. Even the candlesticks which are handed to each one at the entrance are the same. The stock at El Ciego amounts to 5,000 hogsheads but the Marques de Riscal owns another establishment at La Guardia the old fortified town visible some ten or fifteen miles to the north-east.

At El Ciego the varieties cultivated are Tempranillo, Graciano, Cabernet Sauvignon and Malbeck to which is added a small quantity of white grapes (Jaen and Calagraño). The vines are planted 6 ft. 6 in. x 3 ft. 3 in. and trained on wires as at Bordeaux, an unusual sight in Spain. The photograph of some of these vines before pruning gives an idea of the system of training.

The soil here contains a good deal of clay and is considerably stiffer than at Haro but strange to say the wine is if anything lighter. Don Victor informs me that these wines are usually at their best at five or six years old. At El Ciego, as also in the Haro cellars generally, wines are fined rather than filtered. Filters, however, are rather largely used but always the coated bag system and not the more drastic paper pulp filter so largely used in Australia. The use of eggs for fining wines is very general.

Australians would do well to take a lesson from Spaniards who appreciate their own good wines and drink them instead of importing wines from elsewhere. The few details above given will give some idea of the importance of the Rioja wine industry in Spain.

I left Cenicero by the evening train for Zaragoza and Barcelona. I desire to here tender my sincere thanks to Don Victor Manso de Zúñiga, Don Arturo Marcellino and several other gentlemen to whose kindness and courtesy I am indebted for the information I was enabled to gather concerning viticulture in this most interesting part of Spain.

ARSENATE OF LEAD SPRAY FOR APPLE ROOT BORER.

C. French, Jun., Assistant Government Entomologist.

Early in November Messrs. Lawford and Toogood, well-known fruitgrowers of Doncaster, drew my attention to a number of apple root borer beetles, which they had reason to believe were poisoned by the arsenate of lead spray used against the codlin moth. As the root borer has always been one of the growers' most difficult pests to deal with, I conducted some experiments to test the matter. A large twig of an apple tree was sprayed with arsenate of lead, and about a dozen of the borers placed upon it in an observation box. On examination twenty-four hours after all of the beetles were dead, the contents of their stomachs having turned black. Specimens of the insects were submitted to the Government Analyst for examination, and arsenic was detected in them all.

As this is an important discovery as far as the fruitgrower is concerned, growers will do well to use this spray when combating this pest in future. The spray can be used in the same proportions as is given in the Department's formula for codlin moth.

THE ELEMENTS OF ANIMAL PHYSIOLOGY.

W. A. Osborne, M.B., D.Sc., Professor of Physiology and Histology, Dean of the Faculty of Agriculture in the University of Melbourne.

(*Continued from page* 683).

XVI. The Central Nervous System.

The central nervous system is composed of a vast number of neurons collected together and forming a column or cord with two pairs of special expansions. The greater part of this column is composed of the SPINAL CORD which lies in a bony arch in the spine. This portion continued into the skull constitutes first the MEDULLA OBLONGATA, then the PONS, then the region of the CORPORA QUADRIGEMINA, and then the region of the THALAMUS. One paired expansion arises from the pons and is called the CEREBELLUM, the other paired expansion arises from the top of the column and forms the CEREBRUM, or brain proper, a portion of the central nervous system which is relatively very small in the lower vertebrates but, in the mammal, fills up the greater part of the cavity of the skull. That portion of the column which lies within the skull, namely from the thalamus to the medulla inclusive, is frequently termed the BRAIN-STEM.

A striking feature of the central nervous system is the large number of nerve cells present which, when massed together, constitute with their smaller processes what is termed *grey matter*. Intermingled with the nerve cells and their processes in the grey matter is a frame-work of cells called neuroglia. The axons arising from the cells in the grey matter when invested with insulating sheaths tend to run in strands and constitute what is termed *white matter*. But the majority of the processes of the nerve cells do not possess this sheath and do not extend beyond the limits of the grey matter. The sheathed axons of the white matter closely resemble the nerve fibres of the peripheral nervous system; they differ however from these in not possessing the external sheath or neurilemma, and, probably owing to this deficiency, cannot regenerate when injured. White matter is also devoid of the framework of connective-tissue which gives a characteristic toughness to nerve trunks; in consequence it is soft and pulpy and the constituent fibres are more easily ruptured. In the chapter on nerve it was stated that the cells of the afferent and post-ganglionic neurons were all external to the central nervous system whilst those of the motor and preganglionic neurons lay within the central nervous system. But these latter constitute only a minute fraction of the total number of cells in the grey matter. By far the greater number of the neurons of the central nervous system are connecting neurons allowing impulses to pass from one portion of the C.N.S. to another and forming so many junctions, by means of synapses, that each afferent neuron is placed in physiological connection with every motor and preganglionic neuron and probably with every cell in the whole central nervous system.

THE SPINAL CORD.—In this portion of the central nervous system the grey matter forms a central core completely surrounded with white matter. The fibres in the white matter connect different regions of the spinal cord with each other and further allow impulses to pass from all its levels to the brain-stem and brain and *vice versâ*. One very long tract of white matter carries impulses from the fore-brain to

the spinal cord and is probably concerned with skilled movements. The shape of the grey matter on cross section of the cord is characteristic (Fig. 59). On each side will be found a blunt ventral horn containing amongst many others, large nerve cells which are those that give rise to motor nerves; a sharp dorsal horn into which stream afferent fibres; and in some regions of the cord a small lateral horn probably connected with the preganglionic fibres of the autonomic system. The spinal cord, both white and grey matter, is almost divided into two by a deep dorsal cleft or fissure and a shallower and more open ventral fissure. If the spinal cord be dissected out it will be seen that on each side and, at a

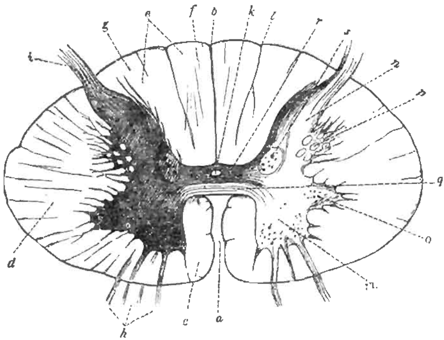


Fig. 59. Transverse section of spinal cord (semi-diagrammatic). *a*, ventral fissure; *b*, dorsal fissure; *c*, *d*, *e*, *g*, white matter; *h*, ventral rootlets; *i*, dorsal root; *m*, ventral horn; *n*, dorsal horn; *o*, lateral horn. (After Erb.)

series of different levels, the peripheral nervous system arises by means of "roots." (Fig. 60). On the dorsal side are the dorsal roots, each with its ganglion attached, in which the nerve cells of the afferent fibres are situated. Each dorsal root is made up of a large number of fibres wholly afferent in character and is connected with the dorsal horns of grey matter and with the dense mass of white fibres on each side of the dorsal fissure. The ventral roots arise, as the name indicates, from the ventral aspect of the cord and are connected with the cells of the ventral horns. In all regions of the cord they contain motor fibres for voluntary muscle but in the thoracic and sacral regions they include preganglionic fibres as well. Each ventral root joins a dorsal root a short distance beyond the ganglion on the latter, and thus a mixed nerve trunk is produced. This condition may be taken therefore as typical of the whole cord—a dorsal series of groups of neurons bringing in afferent impulses and a ventral series allowing an outflow of impulses to voluntary muscle and the organs innervated by the autonomic system.

Afferent impulses reach the spinal cord from receptors in the skin of the trunk, limbs and tail, from the pelvic viscera, to some degree from the abdominal alimentary canal, and from the proprioceptors in the tendons, ligaments, muscles and joints of the trunk, limbs and tail. The motor

outflow is concerned with the muscles of the trunk limbs and tail. The thoracic autonomic outflow produces constriction of arteries throughout the body, acceleration of the heart, erection of hairs over the whole skin, dilation of the iris, inhibition of gut movements, &c. The sacral autonomics produce contraction of the colon, rectum, bladder and uterus, and special movements of the genital apparatus in both sexes.

If the spinal cord be cut across in the lower neck region a mammal continues to breathe by its diaphragm and can live many months. In this case the whole of the central nervous system posterior to the cut will be isolated from the higher nerve centres, but it will continue, after a brief period of shock, to act normally. As already pointed out in Chapter III. the function of the central nervous system is to divert afferent impulses along particular paths and lead them eventually to the exit nerves. (Fig. 37.) In this way reflexes are produced. For instance in a dog operated on as described, the afferent impulses, started by movement of a few hairs on the back of the animal, will enter the spinal cord below the

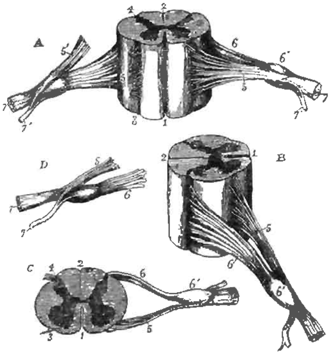


Fig. 60. Different views of a portion of the spinal cord with the roots of nerves.—1, ventral fissure; 2, dorsal fissure; 3, origin of ventral rootlets; 4, tip of dorsal horn with entry of dorsal root; 5, ventral root; 5^1, ventral root divided; 6, dorsal root; 6^1, ganglion on dorsal root; 7 and 7^1, roots combined to form mixed nerve which divides at once into two. (After Allen Thomson.)

cut, will traverse definite channels, and will finally leave by the motor nerves which innervate certain muscles in a rhythmic way and thus produce a movement of the hind limbs which we call scratching. The foot will be applied fairly close to the region tickled though the animal, through the operation, is unconscious of the stimulus and even of its own response. A decapitated frog will scrape off with wonderful accuracy a piece of paper soaked in acid which has been applied to its flank. As another instance may be given the reflexes due to afferent impressions arising from the presence of fæces in the rectum: these enter the spinal cord, are grouped within the grey matter, and finally leave the cord by the nerves, motor and preganglionic, which are concerned with that combined action of muscles, skeletal and smooth we call defæcation. It so

happens that in this case the region of the grey matter where the distribution is effected is small and circumscribed and we thus speak of the *centre* for defæcation. A trifling injury to the cord may destroy this centre and rob the animal of its power to defæcate normally. Similarly there are centres for the bladder and for the sexual organs. It must be noted in this connexion that, when muscles are involved in a reflex, it is not enough merely for certain muscles to be activated—others must be stopped or inhibited. Thus in the act of defæcation the sphincter of the anus must relax: when in the act of scratching, the hock is *flexed* it will be found that the muscles which *extend* the hock lose their tautness or "tone" and *vice versâ*. The muscular and visceral reflexes carried out by the spinal cord, as also those of the brain stem, have a distinct purposive character; thus a spot tickled is scratched, fæces and urine are expelled, a limb is withdrawn from a source of injury, &c. In the whole central nervous system, except the fore-brain, we find that the chains of neurons along which the impulses pass are definite and inborn. Certain stimuli or sets of stimuli will provoke certain responses and only these. It will be apparent, from what has been stated above, that a reflex may be lost through injury to receptors, or to afferent fibres, or to the central nervous system, or to exit fibres, or to the receptive substance or active structure of the muscle or gland.

The medulla oblongata is really a continuation of the spinal cord headwards. The typical arrangement of the grey and white matter is however disturbed, the central core of grey matter being broken up by strands of white fibres, whilst special accumulations of nerve cells occur in the midst of the white matter. It is in this region that the great strand of white fibres, on either side, passing from the forebrain to the spinal cord, crosses from one side to the other and produces what is called the "decussation of the pyramids." It is owing to this decussation that an apoplectic seizure involving, say, the *right* side of the forebrain, conditions a partial paralysis of the *left* side of the body.

In the PONS the distribution of grey and white matter is still further disturbed by the presence of fibres entering and leaving the cerebellum and connecting together the two lateral expansions of this organ. Taking the pons and the medulla together it may be briefly stated that the nerves arising from this region are the 5th cranial or *trigeminal*, the 6th cranial or *abducens*, the 7th cranial or *facial*, the 8th cranial or auditory, containing however fibres from the semi-circular canals as well as fibres from the cochlea, the 9th cranial or *glossopharyngeal*, the 10th cranial or *vagus*, the 11th cranial or *spinal accessory*, and the 12th cranial or *hypoglossal*. The afferent supply of the medulla-pons region is large and embraces the following—from the skin of the forehead and face, the teeth, and the mucous membranes of the mouth, eye and nose—these enter by the 5th; from the organ of hearing and from that great proprioceptive organ, the semicircular canal system—these enter by the 8th; from the mucous membranes of the pharynx, back of the tongue and the Eustachian tube, and probably from the taste receptors—these enter by the 9th; from the heart and aorta, the trachea, bronchi and lung, and the mucous membranes of the alimentary canal from the œsophagus to the colon—these enter by the 10th; and finally from the muscles innervated by the motor outflow from this region. As the medulla and pons are not isolated from the rest of the C.N.S we accordingly find that the afferents of the spinal cord send up branch fibres that enter here into the grey matter, and similarly afferents

entering higher up in the brain-stem make connection with this region by circuitous routes. The motor outflow proceeds to the muscles that move the tongue—by the 12th; all the muscles of the larynx except one—by the 11th; the muscles of the jaws—by the 5th; the muscles of the face—by the 7th; the muscles of the soft palate and the pharynx and one muscle of the larnyx—by the 9th; and the external (posterior) *rectus* muscle of the eyeball—by the 6th. The autonomic outflow is very considerable and includes inhibitory to the heart, secretory to the glands of the stomach, motor to the smooth muscles of the alimentary canal from the œsophagus to the first part of the colon—these pass out by the 10th; secretory to the salivary glands and the glands of the mouth by the 7th and 9th. Perhaps the most remarkable feature of the medulla is the number of centres for various visceral reflexes which it contains—there are, for example, centres for the heart movements, for arterial constriction, for respiration, swallowing, vomiting, secretion of saliva and regulation of temperature. The pons contains the centre for closure of the eyelids on irritation of the cornea or strong illumination.

The CEREBELLUM may be regarded as a great expansion of the brain-stem connected with the proprioceptive system. It has a peculiar laminated structure with *grey matter external and white matter within. Into it* stream branch fibres from the nerves coming from the semi-circular canals and from the afferents of those muscles, tendons and joints that are concerned with body movement and posture From the cerebellum nerve fibres pass to the brain-stem and particularly to the spinal cord. If the cerebellum be injured, the animal moves in a peculiar reeling or drunken manner or, if the injury be a serious one, may spin round or turn somersaults with considerable violence. The tautness or "tone" of the various muscles of the body not actually in active contraction is partly attributable to cerebellar influence.

The region of the CORPORA QUADRIGEMINA receives scarcely any afferent fibres directly. It has a small motor outflow to the *superior oblique* muscle of the eyeball by the 4th cranial or *trochlear*, and to all the other muscles of the eyeball (except the posterior or external rectus) by the 3rd cranial or *oculo-motor*. The autonomic outflow occurs *viâ* the 3rd nerve and has to do with the ciliary muscle of the eye and the constrictor muscle of the iris. This region contains centres for the adjustment of the pupil to varying strengths of light, for phonation, for quadrupedal progression, and for sneezing.

The region of the THALUMUS is that portion of the brain-stem where branch fibres from all the afferents of true sensation entering the central nervous system meet and then form new relays that spread into the forebrain. A special protrusion of the thalamic region forms the so-called *optic* nerves (2nd cranial). An upward protrusion forms the pineal gland which is really a degenerated eye; a downward protrusion forms the pituitary gland the use of which is unknown (Fig. 61). The so-called olfactory nerves (1st cranial) are often described as entering the forebrain; they are most likely protrusions from this region. The thalamus contains centres for guiding body movements by vision.

The forebrain, brain proper or CEREBRUM consists of two highly convoluted expansions or hemispheres. As the grey matter is external to the white matter the area of grey matter is increased the greater the intricacy of convolution. The cerebrum has been described as the organ of consciousness and of intelligence. From the physiological standpoint

it may be regarded as the organ of memory and of skilled movements. In all the regions of the central nervous system previously described the neuron paths, along which the impulses run, are inborn and are probably not affected in the animal's lifetime. A dog without a forebrain will eat, sleep, bark, growl and bite, but it will never associate its sensations. If fed by a particular man and from a particular vessel it will never link up the sight of the man or the vessel with the act of eating but will struggle violently with its keeper until the food is thrust into its jaws. A human being in a state of complete idiocy is in much the same condition. Into the forebrain there enter relay fibres from all the afferents which give sensations and particularly those of sight, smell, hearing and pain. From the brain there emerge fibres which never pass out of the central nervous system but proceed, firstly, to the grey matter throughout the whole cord which controls muscular movements, and, secondly, but to a much lesser degree, to the various visceral centres. The action of the cerebrum may be

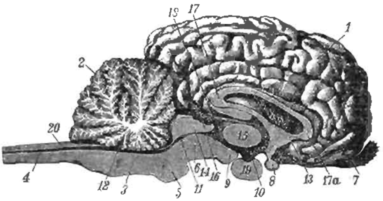


Fig. 61. Vertical longitudinal section through brain of horse.—1, left forebrain or cerebral hemisphere; 2, cerebellum; 3, medulla oblongata; 4, spinal cord; 5, pons; 7, olfactory "nerve"; 8, optic "nerve" cut short; 14, corpora quadrigemina; 15, thalamus; 16, pineal gland; 17, bridge (cut across) connecting the two cerebral hemispheres; 19, pituitary body. (After Hagemann.)

looked on largely as an interference with the reflex mechanisms of the rest of the C.N.S.; some of the fibres start or augment, a great many can check reflexes; other fibres can set muscles acting in a particular combination and sequence that would never occur in any reflex at all. These last mentioned, which have to do with skilled movements, show increasing development the higher the animal is in the evolutionary scale. When the heart's action is increased by fear, when the saliva and gastric juice are secreted on merely seeing preparations being made for a meal, we have two of the many instances of the action of the forebrain on visceral reflexes.

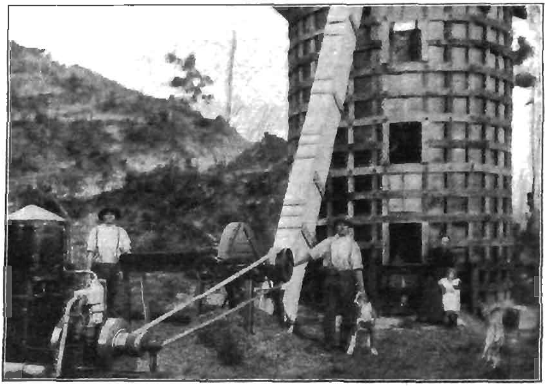
We may regard the nerve paths (or the synapses—see Chapter III.) in the forebrain as being sensitised so that the passage of a particular group of impulses produces an actual physical change and allows subsequent impulses to pass more readily along these paths. This is the physical basis of memory whereby past experiences are registered and to it we may ascribe also the fact that "an act repeated becomes a habit" &c. An animal possessing a cerebrum can guide its conduct by its own previous errors and successes, whilst human actions can be regulated not only by these but also by the experiences of others properly communicated, by true reasoning, and by ideals. But bereft of its forebrain an animal is a pure automaton whose responses to stimuli are predestined and predictable.

SILOS AND SILAGE.

I.—NOTES ON LAST SEASON'S WORK.

E. A. Ryland, Silo Supervisor.

During the financial year ended 30th June, 1908, fifty silos were erected for farmers. This number is somewhat less than that for the previous year; but the diminution is easily accounted for by the abnormally dry season just passed through in the greater part of Victoria, resulting in a lesser quantity of green fodder being produced. However, the scarcity during the past season will, no doubt, induce many farmers to save not only any surplus fodder they may have, but show them the necessity of growing green fodder crops and preserving them in the most economical manner, which is through the chaffcutter and silo.



SILO AND PLANT—CUTTER AND ELEVATOR UNATTACHED.

It has been the experience of the Department that in many instances a farmer will not launch out even to the extent of a preliminary deposit, to secure a silo at cost price, on easy terms, unless he sees that he has sufficient material wherewith to fill it. Opportunities are often lost by waiting, and it would be perhaps better for the stock, and also the stockowner, if he first secured his silo; then he would have a suitable place for conserving his surplus green fodder when it was available.

The capacities of the silos built during the past season have ranged from 45 to 130 tons, and in every case the owner has only been sorry that he did not conserve more of the same succulent, milk producing material. The animals that have benefited mostly have been the dairy cows, and these were kept in good milking condition and were ready to give the dairyman the benefit of the earliest part of the present season.

Lambing ewes have also benefited greatly where silage has been fed, as can be seen from the reports of the sheep owners who fed silage. The silage stimulates the ewes to produce a good flow of milk, the result being a healthy fast-growing lamb.

The principal crop used up to December, 1907, was oats; the varieties being Algerian, Calcutta, and varieties of white oats. Mixed crops such as peas and oats, barley and oats, have also been converted into silage with even greater success than the single crop, the reason being that the food constituents were more varied. It is doubtful whether winter cereal crops have been used for silage to the same extent in any country as in our own State. The fodder crop which has given the best result is maize, and there is no doubt that this crop, where it can be grown successfully, is specially adapted for the silo, on account of the small acreage required, and also because of the solidity of the stems of the plant, which, by not harbouring any air, helps to a great extent to reduce losses and so save valuable food material.

It is interesting to note the increasing number of silos erected by farmers apart from those instances where the assistance of the Department has been given. The majority of these are overground, and are built on the principle adopted by the Department, namely, the circular wood and iron type which has been found to be the most serviceable. Numerous concrete silos, both solid and hollow walls, have been built and also a number of the type known as the "Russell" silo.

The effect that a silo has in awakening interest in the surrounding district is very noticeable. Perhaps the most striking case is in the Poowong district. Early in the present year, an 80-ton silo was erected for Mr. J. R. Mathieson, and filled from an area of 4 acres of maize. The operations of filling and emptying the silo were closely watched by surrounding dairymen, with the result that four farmers within a short radius of this silo have applied for Departmental assistance, and silos will be built to hold the growing summer crops. Mr. Mathieson has since decided to erect a second silo of a 100 tons capacity.

Since June last six farmers have doubled their fodder conserving capacity by building a second silo.

A striking instance of the value of silage in the Western District is worthy of mention. Messrs. Savin Bros., of Macarthur, first erected a 60-ton silo, the capacity of which was soon increased to 100 tons. The returns of milk supplied to the factory from the same cows for the month of June, 1907 and 1908, were £5 and £25 respectively. Of course, allowance must be made, owing to scarcity, for an increased price for the milk, but nevertheless the difference in the amount is striking and leaves a wide margin due to the fodder saved in the silo. Messrs. Savin Bros. have now erected a second silo of 100-ton capacity.

USEFUL HINTS IN FILLING.

Endeavour to secure the crop when it contains as much nutriment and natural juices as possible. Generally speaking, this is attained with winter cereal crops when the grain is well formed but still in the milky stage; with maize, sorghum, and the like, when the grain is formed and in the glazed stage.

Set the chaffcutting plant well, paying some attention to the elevator which should be set up squarely and attached to the chaffcutter so that the material will run directly into it without unnecessary openings for

chaff to escape. The elevators supplied by the Department are built to carry the material up the bottom floor, but can be worked to carry on either top or bottom floor.

A shute inside the silo will be found of great advantage because it will keep the heavy and light stuff together and so help to produce a more uniform sample. By means of the shute the material can be made to fall where required, so making the spreading and trampling easier and more comfortable for the man or men inside. Bricks or short lengths of wood will be found to be the most handy material to weight the silo with, as they can be taken up by the elevator when driven slowly after all the material is in and the silo capped with 12 inches of damp straw chaff or cavings. The material during filling cannot receive too much trampling, especially around the iron.

REPORTS BY FARMERS.

The following are extracts from reports on silos built by the Department. They will be of interest because they come from practical men who have realised the value of saving green fodder for the months of scarcity.

Mr. Thomas Mason of Warrenheip writes:

My silage was made from a mixed crop of wheat and oats. I cut the stuff with a mower and carted it straight into the silo, spread it thinly over the silo and trod it well. I think we filled it up about 7 or 8 times before it thoroughly set. I put 7 acres of crop in the silo, but none of it was chaffed; about 2 feet on the top was mouldy. I used no weights but let it settle down and put about a ton of straw chaff on top and made it wet and trampled it tight. After the top 2 feet it began to get better, but the cows ate it all. There was about a foot around the sides a little mouldy but they ate every bit. I am going to chaff every bit next time as I believe it will be better chaffed. If I had the means I would have another erected at once. I believe that it would be better if we could weight the silage as I find that the bottom is far the best. I shall try and devise some means of weighting this year. I find that my 25 cows will eat two silos empty from March till October and not get too much. Our silo holds 60 tons.

The Department strongly condemns filling the silo without first chaffing the material, the reason being that by chaffing the material can be packed more tightly thus excluding air and saving food value. Also, the material is more economically handled when feeding; Mr. Mason's experience agrees with this.

Mr. T. Malone of Corop gives his experience:

Re silo. I was satisfied about it, but unfortunately the season came so bad that I had to feed out the silage before it was matured. It was just getting good as it ran out. I consider I had about 80 tons and expect to erect another silo before long. I managed to keep all my stock in fair order but we are having a bad time at present. They don't take too kindly to straw stacks after having eaten up the silage.

Mr. J. R. Mathieson of Drouin writing in June, says:

At present we are milking 20 cows. Our 80-ton silo was filled by the beginning of March with maize taken from 4 to 4½ acres to fill it. We are now feeding 20 cows at the rate of 4 kerosene tins per cow per day. Fresh-in cows get a little bran mixed with it. The results are beyond expectations. Our cows received a check before the silo was started but on taking to the silage they came back to their milk and put on condition, looking sleek and well fed in the roughest of weather. I may mention that all milkers are rugged. Fresh-in cows are making up to 12 lbs. of butter per week, which proves the value of ensilage as fodder for dairy cattle. We are so delighted with the results that we are ordering a second one to be put up this year. We are satisfied that it is the only way to conserve fodder for any length of time. There are two points which we would like to impress on any one filling a silo for the first time; 1st, that it cannot receive too much trampling, 2nd, that the chaffed maize on falling into the silo wants to be well mixed as the heavy stalks are inclined to fall straight down in one spot and the lighter stuff in the shape of leaves, &c., elsewhere. We would

like to mention our appreciation of the services of Mr. Ryland, Silo Supervisor, which were most valuable and instructive. We hope that our success may lead others to follow as we have had many to see the silo and silage.

The shute mentioned previously will overcome the second point mentioned by Mr. Mathieson.

Capt. A. H. a'Beckett of "Ballintrae," Bunyip, writes in July, 1908, as follows:—

I have been taking ensilage out of my silo for about a fortnight, feeding it to cows and horses, about eight in all. The silo was a little over half full with chaffed maize cut about seven-eighths of an inch long. On opening up the silo there was about four inches of loss through insufficiency of weight on top. I have not come across any mouldy patches. I used green saplings cut in foot lengths to the extent of three and a half tons for weighting. The loss around the edges was about ten inches; the only way I can account for this is through the lighter portion or leaves working to the outside and consequently requiring more trampling. I omitted to say that I put about a foot of straw under the wood blocks. I find the ensilage to be excellent. My idea of weighting the silo is very convenient, as the blocks can be put into the silo by means of the elevator. As the blocks dry they can be used for firewood when finished with

Capt. a'Beckett's experience points to the advisability of the shute in the silo; the idea in weighting is a splendid one, more suitable perhaps to the farmer who has his own saw bench. The length of the blocks need not be limited to 1 foot as the space between the slats of the elevator will easily accommodate lengths up to 22 inches.

Messrs. Addinsall Bros. of Macarthur give the following report:—

We filled the silo with chaffed Algerian oats mixed with about same quantity of trefoil. We were about seven days in filling it. We trampled it well and filled to within a few inches of the top. The remaining 5 or 6 inches we filled with wet chaffed barley straw. We weighted some time after filling, with 3 or 4 tons of stones. We fed the silage to forty cows, also occasionally to two or three horses. Ensilage lasted about seven weeks. It kept the cows in good condition, also kept up the flow of milk but did not increase it. We commenced feeding in February. We find that ensilage is indispensable in this district for February and March. About a foot or more all around the side was mouldy, though there was very little real loss as the cows ate the lot. There were mouldy patches in or near the centre too, which we attribute to putting the stuff in too dry, having had it cut in the paddock too long. We were late in the season getting the silo erected, though we started filling the minute the elevator was up. About 5 acres of crop filled our silo; the crop was heavy, off volcanic soil. We do not consider that our silo had quite a fair show, and we have every confidence of doing better this year, by starting to fill earlier.

The experience of the Department corresponds with that of Messrs. Addinsall Bros., namely, that the material will become mouldy in the silo if it is too dry when put in. Watering during filling is a slight preventative: but it is best to cut the crop before the natural juices are lost. Messrs. Addinsall Bros. have now doubled their fodder-conserving capacity

Mr. H. G. Byrne of Byrneside writing in June last, gives his experience:—

The ensilage is first class. On account of the great shortage of feed, I have to use it sparingly so as to make it extend over this month and a part of next. I should certainly have lost the greater part of my stock were it not for the silo, or provide food at a price which would run me to an expense that would at least be equal to their value. Horses are very fond of it, and as well as cows are fed twice a day. As the cows are fed in the milking shed, there is no waste whatever.

The crop used for Mr. Byrne's silo was maize and amber cane grown on irrigated land. The value of his silo may be seen by his remarks.

Messrs. J. McCallum & Sons of Kaniva reporting regarding their silo say:—

We filled the silo with 40 tons last November; first Calcutta oats, next some Bonanza oats, and finished up with some wheat, wild oats and thistles, &c. The

latter did not make good ensilage as I think they were on the dry side. Calcutta oats made the best ensilage. We put a foot of straw chaff on top and then put on a layer of old sleepers. There was some damaged on top and round the sides, but on the whole it has been satisfactory.

We started feeding the cows with it about the middle of February with fair results. At the beginning of April we started feeding 300 ewes before lambing. The results would have been better had we started earlier. We were highly pleased with the results. Our lambing results are much better than our neighbours, who have been feeding on hay. We intend filling to the top this coming season.

It can be seen that silage can be used for either cows, horses or sheep. The experience of Messrs. McCallum and Sons with lambing ewes is interesting, showing the value of silage over a dry food like hay.

Mr. F. Shackleton of Thorpdale in an interesting report says:—

The silo was filled about the second week in December. Algerian oats, cut in the "doughy" stage, were chiefly used. The best silage was made from a paddock that had been sown down with cow grass and alsyke, using oats as a cover crop. Owing to scarcity of labour only one man could be spared in the silo, with instructions to trample evenly all over. A bag shute was used to prevent material spreading. The following day after filling it was covered with old bags and about 200 kerosene tins of earth were pulled up with block and tackle, and spread as evenly as possible. The silo was opened early in February. There was about 5 inches of waste on top, and occasionally mouldy at edges for 2 or 3 inches wide, but mostly good right to walls. There were not two bags of waste from edges until within a foot of the bottom, when there was a strip around the silo about 2 feet wide to 1 foot in height, presumably caused by air getting under the iron. It was fed to 27 cows—between 40 and 50 lbs. per day with a little bran. With the exception of four, the cows had been in milk since August. In February and March they gave an average of 2 gallons per day, and the average test was 5.0. This silage was finished by the middle of April. I then chaffed up 4 acres of maize (drilled and horse hoed); the crop was only fair. Fed from silo whilst cutting was in progress, and was not weighted in any way but fed straight away. No waste, splendid feed. Cows are all in splendid condition, and will mostly be in early in August; are now (June) being dried off. The silo is a thorough success and makes a dairy farmer independent of the seasons to a great extent, and from my experience increases the return per head from 25 per cent. to 30 per cent.

Mr. Shackleton can speak with authority as he keeps records of each individual cow's milk by weighing and testing.

Messrs. Condon Bros. of Thorpdale give their experience:—

The material used was green oats which we filled and trampled right to the roof, let it stand 24 hours, put on a layer of winnowings of oats wetted, then 4 tons of earth. Time taken to fill three days, 19th to 22nd December. We opened it on the 19th of February and were disappointed to find a good bit bad on top, also about 6 inches right round the wall to the ground, also a good few mouldy patches through it. We fed 36 cows on it for 71 days, and we were greatly disappointed to find we had only about 35½ tons instead of 60 tons, as some of the experts reckoned.

The feeding value was satisfactory, but as to it being mouldy round the wall, we cannot give any reason for it except the thin wall. We think the cold air round the outside is the cause of it.

Messrs. Condon Bros.' experience points to considerable loss around the walls and mouldy patches through the silo, although, according to the letter, the material was trampled. The theory about the cold air may be correct, but experience with an iron silo weatherboarded on outside proves there is still waste around the edges. In the Department's opinion the material for filling in this case was too dry. The crop when seen by the silo supervisor some days previous to filling was reported on as then ready and was drying fast. Doubtless there is more waste with cereal crops than with other crop, such as maize, sorghum, &c.

Farmers desirous of having silos erected upon the Departmental terms must apply in accordance with the following form, copies of which can be obtained on application to the Secretary for Agriculture, Melbourne.

APPLICATION FOR THE CONSTRUCTION OF A SILO.

190 .

The Secretary for Agriculture, Melbourne.

I hereby apply for the construction of a Silo and of an Elevator to fill same, and I hereby agree to comply with the conditions set forth on back hereof.

Signature—

Witness to Signature—

PARTICULARS TO BE FURNISHED AS FAR AS POSSIBLE.

Name of Applicant in Full—

Name of parish and No. of allotment—

Postal address—

Nearest or most convenient railway station—

Distance from station—

Capacity of silo required—

No. of Stock to which silage is to be fed : Cows— Sheep

Crops proposed to be grown for silage— No. of acres—

Make and No. of chaffcutter— Diameter of cutter spindle—

Size of horse-works—

Steam or oil engine— Make and horse-power—

Proposed filling arrangements—

Proposed method of payment—In full or on terms as set forth in conditions—

CONDITIONS.

Before the erection of a silo is commenced, the applicant must either pay in full the amount claimed by the Department of Agriculture as the cost of supplying and erecting the silo, or he must pay one-third of such amount in cash, and lodge two promissory notes each for one-half of the balance, payable at 12 and 24 months respectively. Should the property on which the silo is erected be sold at any time, the balance of cost unpaid shall become payable forthwith.

The applicant must cart the silo material from the nearest railway station to the site; must meet the builder when advised, convey him to the work, board and lodge him and provide him with the necessary assistance (three men) while building —four to six days.

The green fodder must be chaffed and the silo filled and weighted under the supervision of an officer of the Department, or in accordance with instructions issued by the Department. Full records must be kept of the results obtained from feeding the silage and a report made to the Department.

Special arrangements may be made for the erection of silos of a class other than those listed below.

NOTES.

The ordinary horse-works and chaffcutter are suitable for cutting and filling silage.

The silo should be well white-washed inside with a thick wash made of lime and skim milk. This can be done each evening after filling, the silage serving as a scaffold.

The crop should not be cut until it has reached the proper stage of maturity.

Trample the silage as much as possible, especially round the sides, keeping the centre high.

Fill in not less than 5 feet and as much as 12 feet per day.

When filled, put on a 12-inch layer of chaffed straw well wetted, and load over whole surface with 3 to 5 tons of earth, stones, or other convenient material.

It is better to chaff the green stuff on the day that it is cut.

Keep the bottom hoop clear of earth and rubbish.

See that the bottom of each stud is supported by a brick or suitable stone.

DETAILS OF CAPACITY, MEASUREMENTS, AND COST.

Capacity.	Measurements— Inside Diameter.	Height.	Weight of Materials.	Cost, including Elevator— Not exceeding 100 miles from Melbourne.	Over 100 miles, but not exceeding 200 miles from Melbourne.	Over 200 miles from Melbourne.
tons.	ft.	ft.	tons.	£	£	£
45	12½	21	3½	33	35	37
60	15	21	4	35	37	39
100	15	30	5	45	47	49

NOTE.—Cost of Elevator alone is as follows:—For silo, 21 feet high, £6; 30 feet high, £7; so that if Elevator not required, cost of Silo as shown above would be reduced by this amount.

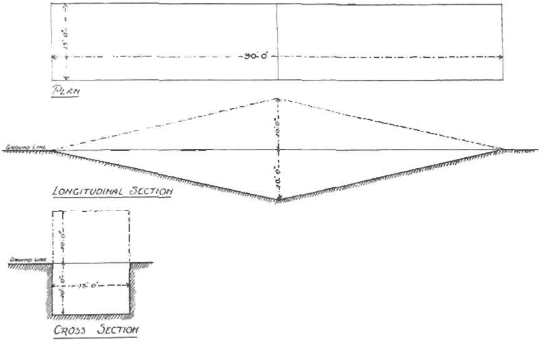
II.—SILAGE-MAKING AT COLLENDINA.

G. H. Adcock, F.L.S., Principal, Viticultural College, Rutherglen.

The practical value of having stores of food for stock was amply demonstrated on the Viticultural College farm at Rutherglen during the recent severe season. While the mortality among both sheep and cattle in the immediate districts has run into alarming figures we have not lost a single hoof. Apart from the disastrous financial losses incurred by the death of so many valuable animals, no one with a trace of humanity can regard without feelings of deepest regret, the intense sufferings entailed on the dumb animals during their lingering deaths from starvation. This is a phase too often, one fears, overlooked. These creatures have a right to look to their owners for their daily food, and humanity demands they shall not look in vain.

Owing to the variable character of our seasons the full carrying capacity of our pastures cannot be utilized without the conservation of some of the surplus of one period for the deficiency of another. In prolific years like the present, stock cannot consume fast enough the luxuriant growth so favorable a season has induced. At present it may be safely said that almost every run is understocked. But in a few weeks' time the reverse will be equally true. On Australian runs the paradox exists that the same number of stock on the same area represents understocking at one season, and considerable overstocking at another period of the year, when the scorching summer sun and the fierce hot winds have destroyed the natural herbage and left the earth practically bare. The practice of conserving the surplus of the years of plenty for the inevitable years of scarcity is as old as history itself, and the wonder and the pity of it are, that it is not more universally recognised in Australia. The writer had the privilege of seeing how successfully this has been carried out with a minimum of handling and consequent cost on the Collendina estate (Messrs. H. Hay & Son), beautifully situated on the Murray.

Pits with two vertical sides are excavated by scoops to a depth of 10 feet in the centre, 15 feet wide and 90 feet in length, leaving a gradual slope for entrance and exit. Into these excavations the surplus fodder is carted, the loaded drays going over the material already deposited, and discharging their loads where desired. The fodder being treated at the time of my visit consisted principally of wild oats, barley grass, and a fair percentage of trefoil. The latter is a valuable constituent of the silage as its food value is considerable. At this time of the year barley grass in its natural state is not only useless as feed, but a nuisance, and a menace to the sheep. The obnoxious seeds are rendered palatable by the fermentation they undergo in the silo. The material is cut with mowers, raked into rows, and carted with a minimum of handling to the pit. Even when the material is piled up above the surface level, the drays still traverse the fodder already stored. It is a most interesting sight to see the teams climbing the steep inclined plane on the unstable material for a footing. This constant traffic on the accumulating mass is of great service in consolidating it and thus excluding air—an important feature in successful silage making.



PLAN OF COLLENDINA SILAGE PIT.

A simple but ingenious contrivance is utilized to unload the drays at the required spot. This consists of wires attached to the back and of sufficient length to reach the whole length of the dray. A hook is attached to these wires and allowed to hang free over the front. The wires are thrown on the floor of the empty dray and the load is put over them. As the dray is about to be drawn up the inclined plane of fodder, a rope is passed through the hook. When it is desired to deposit the load, the rope is tightened and the dray is drawn along leaving its burden on the the heap. The heap above ground corresponds in shape to the excavation below and the material is carted up the two inclined planes in alternate loads. There is no delay. The whole system has been so carefully planned that it works automatically. When the heap is finished it is completely covered by about 2 feet of earth, and is then quite safe till required. Showery weather, so inimical to hay making, is rather an advantage than

otherwise when silage is being made in the pits. The objection that seepage will find its way into the pits and so destroy their contents, is robbed of its significance here, for a stratum of loose sand is met with a few feet below the surface providing ample drainage. Where the ground is of such a nature as to hold water, a small well is sunk in the lowest part of the pit. This is covered with slabs or even filled with straw, and has proved eminently satisfactory.

So convinced is Mr. Hay of the value of the silage that at the time of my visit 15 large pits had already been constructed and others are contemplated. These will store something like 3,000 tons. In one paddock 30 men were actively engaged with the necessary machines and horses in providing for the future. Handled in large quantities in so methodical a manner, the cost per ton is low.

Last season will long be remembered as one of the most serious that the pastoralist and farmer have had to contend with. Owing to the deficient rainfall there was a very considerable shortage of fodder. Excessively high prices for hay and chaff ruled, and stock literally died by thousands. Those flocks and herds that were kept in anything like condition cost their owners almost fabulous sums. By means of a little forethought and such provision as has been described, Mr. Hay not only saved his stock, but kept all in excellent condition. This is evidenced by the fact that during the height of the drought, large drafts of fat bullocks were sold at highly remunerative rates. While there was no natural herbage 7,000 weaners were kept in splendid condition for several months at a minimum cost on silage. There was no break in the wool, and their growth was satisfactory and rapid. Working bullocks doing 11 hours daily of heavy excavation, actually put on condition on their ration of silage, and enabled the teams to be reduced on the same work. While other less provident pastoralists were expending enormous sums for fodder, often of an inferior kind, or were renting grazing rights in remote districts, Mr. Hay had already provided, at moderate cost, the necessary foodstuffs from his own land. This not only enabled the stock to tide over comfortably a most trying period, but the estate was not robbed of the fertilising influence (which can hardly be overestimated) of large numbers of herbivorous animals.

No farmer or grazier is safe unless he has at least six months' fodder conserved for a period of emergency. Stored in the form of hay, there is imminent risk of loss by fire, and material can be utilized for silage that is utterly unsuitable for hay. In a season of luxuriant growth there is considerable risk of grass fires when the herbage becomes dry. Stored under the conditions described these risks are avoided, as the rank growth is removed and saved. The results afford a striking object lesson. By bitter experience—that dearest but best of all teachers—we are gradually learning and ere long such methods of conserving fodder will become general and usher in the pastoralists' millennium. The writer's thanks are heartily tendered to Mr. H. A. Hay for much valuable time given, and useful information so courteously imparted.

III.—SILAGE FOR DAIRY CATTLE.

J. S. McFadzean, Dairy Supervisor.

Every form of life that we have any knowledge of is built up of countless small living masses of micro-organic or protoplasmic formation

which are called cells. A growing plant is no exception to this rule, and throughout its whole structure there is a continuous circulation of air, and a fluid which we know as sap, and which performs some of the functions of blood in the animal. This sap conveys to the growing plant the food which is drawn from the soil by its roots; and from which is built up, first the framework of the plant itself, and finally the flower and seed formation by means of which the plant or some variety of it will ultimately be reproduced. When a plant is either cut down, or approaches maturity, the circulation of fluid throughout its system ceases; the leaves and stalks wither through evaporation of moisture; the cells within it die; and, in the absence of the sap, the fibrous material of both leaf and stalk becomes drier, harder, and less easy of digestion by animals.

No fodder is relished so much by stock as the fresh spring pasture that is forced into rapid growth by the seasonable combination of warmth and moisture in the soil. Its appearance is synchronous with the natural breeding season of herbivorous stock, when the young animals require the heaviest milk flow. The mature stock then also again begin to make flesh, and to store fat in their bodies as a reserve against the more scanty food periods of late autumn and winter. No amount of dry fodder can take the place of this green food. It has a wonderfully recuperative action on animals that have become low in condition; and its invigorating effect is upheld by the still more strengthening and sustaining properties of the herbage as it matures and ripens its seed. The animal is thus better prepared to withstand the strain of any shortage of food to which it may later on be subjected by seasonal conditions. Green food therefore is the natural precedent, as well as the accompaniment, of robust health and a good milk flow in the dairy cow; and the farmer who does not make provision to keep his cattle supplied with green food throughout the whole of the year is not doing justice to his herd or consequently to himself. In localities which are favoured with early autumn rains, or where irrigation by any means is possible, this annual dearth of green feed does not so generally occur; but over the larger part of Victoria a full supply of succulent fodder during the late summer, autumn, and winter months is only possible where fodder crops or grass, cut green, have been preserved in the form of ensilage.

Ensilage is a term used to designate green fodder that has been preserved in bulk in such a condition that its original succulent condition and feeding properties are retained. When therefore ensilage is fed to stock, approximately the same results are obtainable from it as from the same weight of the fodder when it is freshly cut or of grass when it is grazed.

This method of preserving green fodder has been known and practised for very many years past; and, while it has not yet received the widespread attention from stock owners in Australia that its value warrants, yet probably in every district of the State there are some who have proved by practical test the inestimable value of ensiled fodder for all stock. The scientific investigation of the process of ensilage making dates back to 1875 when Goffart published the results of some successful experiments with silage carried out by himself in France: and since then the use of the silo in its various forms has become gradually more common throughout Europe, America, and Australia.

The most complete information to date on the subject of ensilage making in Australia is that furnished by Dr. Cherry, Director of Agriculture, in the *Year-Book of Agriculture for* 1905.*

This State is fortunate in being practically sure of a good growing season each spring; and it therefore rests with every dairy farmer to cultivate enough land each season that will enable him to harvest whatever quantity of fodder will be sufficient to keep his stock up to their full measure of productiveness throughout the whole of the ensuing year. It is estimated that a cow will annually consume from 12 to 18 tons of green fodder if it is obtainable; but, as in normal years fully half of this feed can be gathered by the cow on any fair pasture land, the providing of about 8 tons yearly of ensilage for each cow should suffice for all requirements. It is only a very medium crop of maize that does not yield more than this weight of fodder per acre if properly cultivated; and in favorable situations and seasons from two to three times this amount is frequently harvested. As a general and safe estimate therefore it may be taken that the systematic cultivation of an acre of ground for green fodder for each cow kept, and the storage of the crop as ensilage, will enable every dairy-farmer to keep up a regular milk supply from his cows from year to year.

Almost every plant that is useful as fodder in its green state can be preserved as ensilage; and even the coarser grasses, and thistles, that are inferior in quality, or not easily gathered by stock, and are thus seldom eaten by them except under forced conditions, will make into fairly profitable ensilage when sufficiently abundant to be easily harvested. It cannot be claimed that ensiling improves the nutritive composition of any fodder. All that can be looked for under the most favorable conditions is that the material will come out of the silo as good in the way of nutritive properties and palatability as it went in. What does occur in silage making, however, is that during the process of fermentation the hard and fibrous structures of the plants become softer and more easy of digestion: and therefore, whatever feeding value is contained in a coarse fodder is made more easily digestible when it has been ensiled. In the latter case also the plants would be harvested when in the fittest stage for digestion; whereas more often they are past that stage before stock have occasion or will endeavour to use them in their natural state. In putting down as silage any extra soft or immature fodder, it is as well to allow it to wilt to a partially dry stage before chaffing it; or else it should be evenly mixed in with some less juicy material; otherwise there will be an excessive flow of sap from the silo as the fodder settles.

Ensilage is made by the exclusion of air from a bulk quantity of green fodder by close packing; and its quality is mainly dependent on the completeness with which the bulking process is effected. Green fodder when cut and exposed to air either dries up or rots, according to whether the air has free or only partial access to it. As already stated, most grasses or fodder plants in an advanced stage of growth can be made into ensilage; and the best feeding results are obtained when the material preserved is cut in the stage just prior to its ripening. There is then sufficient of the plant juices still present in the stalk to uphold its value as a succulent green fodder; and, with the flower and seed formation well advanced, the plant will then have within itself all the constituents that make it most valuable as food for stock.

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* *Year-Book of Agriculture for* 1905, 448 pp. This work, written by the officers of the several branches of the Department, contains information on general farm and orchard work. Obtainable from all booksellers, or direct from the Department. Price, Cloth edition, 2s. 6d., paper 2s. 6d.; postage 8d.

Oats and maize are the principal crops that are cut for silage in Victoria; the former in the north, the latter in the southern districts. As a general farm practice harvesting an oat crop to the silo can hardly be considered the most remunerative method of obtaining a return from the ground cultivated. An oat crop can be harvested as either hay or grain; and, as such, if the quality is right, can always be profitably disposed of if not required. A maize crop on the other hand can be most profitably dealt with on a dairy farm either as green fodder or ensilage; for when harvested for the grain, the dried stalk is past its best as stock food. Maize is also the crop from which the greatest bulk of green fodder per acre can be harvested in Victoria; and therein its value lies. The method of storing it so that it can continue to serve the purpose of a green fodder is the best for the dairy farmer. It grows, and is harvested, when most other crops are past maturity, and when the pasture grass is drying up; therefore it is as green fodder, available during the summer season when the natural pasturage is scanty and past its best, that maize is so valuable on the dairy farm.

Many dairymen make some portion of their oat crop into ensilage in order to guard against a shortage of green fodder occurring before their maize crop is matured. No doubt in some years this is absolutely necessary; but it need not be so if more maize had been grown the previous year, and more silo accommodation provided for it. A fair maize crop will return three times the weight of fodder per acre that can be gathered from a green oat crop; and when both are in a similar state of maturity there is little apparent difference in their feeding value. As a general thing, therefore, the crop planted for ensilage making should be maize; and enough ground should be reserved from which to harvest the full silo accommodation each year; and the silo accommodation should be sufficient to hold a full year's supply of not less than 5 tons per cow. If it pays to make provision for five months' ensilage supply from the heaviest yielding crop, it must be equally profitable to make full provision in the same way for all that is required; and only sufficient oats need be grown to feed the horses and act as a stand-by for young stock should the pasture fail. Only in the absence of sufficient silo accommodation therefore will it be found most profitable to make oaten ensilage; or when an exceptional shortage of the previous maize crop renders it an absolute necessity. The abundance of wild oats in the wheat growing districts and the assistance the silo affords towards keeping the cereal crops clean, as well as the difficulty in some seasons of growing amber cane or other summer crop without irrigation, explain why the cereals are so frequently made into silage in the north.

As the exclusion of air in ensilage making is obtained by the close packing of the material, the chaffing of the crop before filling it into the silo is an advantageous procedure. By giving extra care to the filling and tramping down of the material good ensilage can be made from unchaffed fodder; but, as the particles of fodder in settling become more or less glued together, unless it is put in in fairly short lengths, it is not handy material to either get from the silo or use in stall feeding afterwards. Thus, while with long stalked fodder, cutting out with a hay knife is necessary, the chaffed material can be easily raked or forked off the top; and as such is not only an easy fodder to handle but it is in handy condition for mixing with chaff, bran, crushed oats, pea-meal, or in fact almost any other fodder as desired.

The tramping or otherwise evenly and solidly pressing down the chaffed fodder over the whole surface while the pit is being filled has been

repeatedly mentioned as the secret of successful ensilage making. The first result of close packing or heaping together of green fodder is the generation of heat within the material, which is caused by the chemical activity of the still living microscopic cells in the plants. As this action diminishes, if the material has been properly packed, the heat subsides, and the fodder is consolidated mainly by its own weight, and is preserved indefinitely. If from any cause air is allowed to remain within, or afterwards gain access to any portion of the silage, the process of heating through oxidization continues. If it cannot be checked the oxidation or fermentation process will continue to develop until a state of putrefaction or rottenness is reached. Air is necessary for the continuance of this increased fermentation; and it will take place wherever and whenever air has access to the material. Where the surface of any ensilage is thus exposed for a few days the material putrifies or becomes rotten, and moulds form to the depth the air has reached. Such damaged material is of inferior quality and is unsafe for horses. When a silo is filled, or is to be left untouched in the process of filling for more than two days it should be at once covered in some way to check this fermentation. A layer of almost any damp material such as weeds, chaff, or bagging wetted, will serve this purpose if sufficiently deep, or weighted to prevent the admission of air.

While the science of ensilage making has so far developed that the process under ordinary conditions presents very little uncertainty, there are still some variations in the general quality obtained in the product that call for some comment. The making of sweet and sour ensilage in various degrees, and the loss in some cases of a small portion of the fodder that is adjacent to the silo wall, have both given rise to much difference of opinion. This science of ensilage making has developed during the last decade to such an extent that the terms sweet and sour silage as we know them now have not at all the same significance as they formerly possessed. In the early years of ensilage making there were only two kinds of silage recognised, sour and sweet; and of these only the sour was suitable for fodder. What was then known as sweet silage was the discoloured and partly decomposed material which from exposure to the atmosphere had lost its acidity, and its usefulness as fodder. More advanced knowledge of this work has however resulted in the making of a much better quality of ensilage at this present date; and that even to the extent of rendering the one-time best or sour silage now only a second class product. There are now three definite stages recognised in ensilage making, and the quality of the product varies in accordance therewith. These are malting, acid fermentation, and decomposition. Silage fermented only to a stage short of souring or acid formation is known as sweet ensilage. When acidity has developed the product is classed as sour ensilage. The decomposed material (the old-time sweet silage) is recognised as such, and should be regarded as of inferior quality. A farmer producing silage of this description should make up his mind to do better next year.

A crop in its most suitable stage—that is when it is approaching maturity—if it is properly dealt with, will make into a first class ensilage. Both its flavour and aroma will be such that it is easily distinguished as sweet silage; for in it fermentation has not developed to the stage of acidity. Dr. Cherry definitely states, in the article previously referred to that the lower the maximum temperature obtained the better quality will the ensilage be. A minimum of heat from fermentation will be obtained when the crop being dealt with is approaching maturity; for there is then a smaller proportion of the plant cells in the active or living stage;

and it is under these conditions that sweet ensilage—the best ensilage—is made. With the higher and longer sustained rise in temperature more or less acidity is developed in the ensilage; and as this change, which is patent to our observation, is also a chemical change that alters the composition in the direction of reducing the feeding quality of the material, the production of sweet ensilage is the more economical. The souring of silage may arise from several causes, such as from ensiling the fodder in a too immature stage; from too quick filling; from the material not being properly tramped or packed in; or from any other cause that may increase the temperature in the silo—a high temperature being the antecedent of development of acidity. In general practice it has been found that about 6 feet is a sufficient depth of material to fill into the silo each day if a minimum temperature is to be maintained; a greater depth tending towards increased heating.

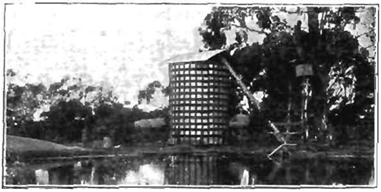
Where any decomposition occurs near the wall surface of a silo it is usually the result of want of care in filling; this being the place where the work of tramping or pressing down is usually most neglected. If the material is not tightly packed at the wall, air must gain access to the adjacent material, and some loss will result. If the walls of the silo were constructed of particularly porous material, such as soft brick, and built above ground, a little loss might occur over the whole wall surface; but the porosity in such cases could usually be checked by the application to the inner wall surface when the pit is empty of a cement wash or a coat of hot tar, to which pitch has been added at the rate of 1 lb. to the gallon. In the filling of a silo a very heavy pressure obtains on the wall surface; but with the cooling and settling down of the mass this pressure diminishes, till the material becomes a solid body more or less independent of any support. When this has taken place any carelessness in filling that has allowed for the admission of air between the silage and the wall will be followed by the decomposition of some material at that place.

In opening the silo, and using the ensilage, the same principles must be observed as in filling and closing it. No more fodder should be taken out each day than can be used. The required quantity should be taken off evenly and regularly from the top of the silo; and, if feeding the ensilage should be stopped for even two days, what remains in the silo should be as carefully covered again as before. The using of the fodder from the side surface of a bush silo is also undesirable; and should not be attempted unless all that is in the pit is certain to be used without a break; for it is almost impossible to cover up a side surface if once exposed; and moulding and decomposition of the exposed silage will result.

To clean ground fouled with weeds without loss of time there is no more profitable way than to make a sowing in the autumn of mixed fodder such as peas and oats, or rye and tares, for green stuff; and then to follow it up, when harvested, by a maize crop with summer cultivation. The green stuff should be harvested for ensilage before the weeds have seeded out; and, under the fermentation in the silo, the germinating power of all weeds is destroyed. If the maize is then sown in fairly wide drills—as it should be, in order to obtain a plant rich in feeding value—and the intervening ground kept well stirred throughout the summer, there should be very few weeds to interfere with a succeeding crop.

Where there is a choosing between maize and any of the cereals as a crop for ensiling the balance must be always in favour of the maize on account of the greater yield. In considering maize ensiling versus hay growing for dairy stock there is absolutely no comparison in returns obtainable, everything being in favour of the maize.

The advantages of having a quantity of green fodder chaffed and stored as silage for winter use are many and obvious. To have to go to the field for a load of fodder and get it into the mangers on a wet day is a task under any circumstances; and when the ground is soft or when the horses are required for other work it is very satisfactory to know that the cows can be well supplied with little labour from a store of succulent fodder close at hand. The possession of an ample supply of ensilage unquestionably makes towards improved dairy returns, while also allowing of the general work of the farm being more systematically and expeditiously carried out. Succulent fodder practically insures a good milk yield; and only in very exceptional cases can this be obtained throughout the autumn and winter months without the use of the silo.



A SILO IN THE MALLEE.

THE PROCLAIMED PLANTS OF VICTORIA.

(*Continued from page 672.*)

Alfred J. Ewart, D. Sc., Ph. D., F.L.S., Government Botanist; and J. R. Tovey, Herbarium Assistant.

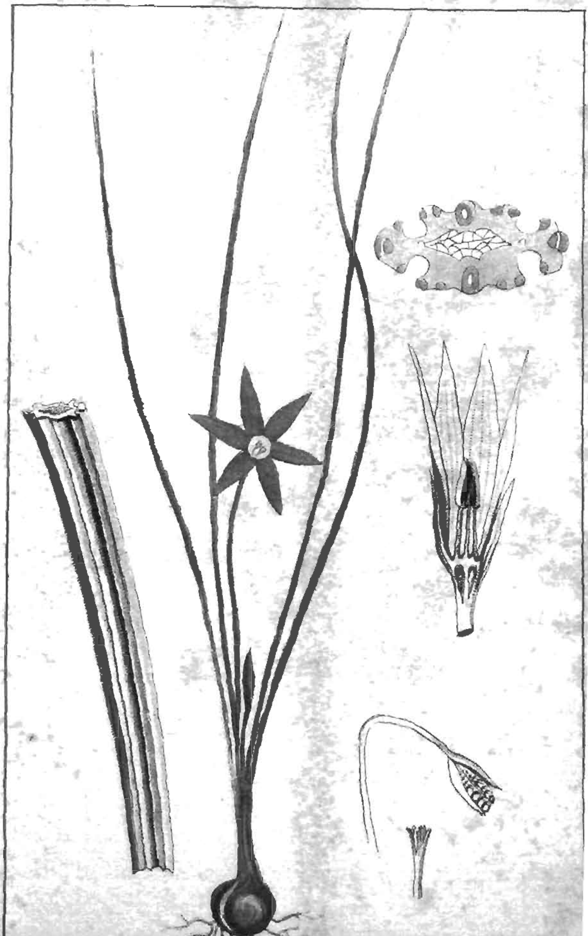
The Guildford or Onion Grass.

Romulea (Trichonema) cruciata, Ker.-Gawl. (*Irideæ*).

This South African plant was called *R. Bulbocodium* (a native of the Mediterranean regions and Scilly Islands) by Baron Mueller, and has been known as *R. rosea* (a native of South Africa), in New South Wales and Tasmania, but is easily distinguished from these species by its short style not projecting beyond the stamens, a character constant in several hundred flowers examined. *R. longifolia*, of Baker, is a synonym, and the Australian *R. cruciata* seems to have diverged sufficiently from the type form of *R. rosea* to be recognised as a distinct species. Each shoot usually bears one or two flowers, but sometimes a single corm develops a cluster of shoots, and the plant then appears to be many flowered. The plant was abundant in the neighbourhood of the Botanical Gardens 40 or 50 years ago, but it has now taken possession of entire paddocks, roadsides and waste places, and like many bulbous plants it is difficult to eradicate.

Its pinkish purple flowers look very pretty among its green grass-like leaves in spring, as they open when the sun shines on them and close at night or in cold weather. The leaves appear in April or May, the

PLATE. 31.



A. J. Ewart, Direx

flowering begins in August, and usually lasts at least two months, the capsules continuing to ripen until November or December, before which time the leaves have died down. The seeds germinate mostly early in the following season when the soil is moist, some may retain their vitality apparently for a few years in the soil.

The ripe corms when crushed yield relatively large amounts of fine-quality starch. They are eaten by pigs and cockatoos, which in some parts have cleared whole districts more or less thoroughly.

Eradication.—The plant is a sun-loving one, preferring hard, dry, more or less bare, unshaded ground, vegetating in winter time and resting during summer. Poisons are utterly useless, as with nearly all weeds.

Cultivation soon suppresses it, winter wheat, followed by farmyard manure and potatoes, being especially good for the first two years; but a green fodder crop is equally good if it is up early in the year, and stands over winter. Fencing off and resting a portion of the pasture each winter will aid the grasses greatly in suppressing the weed. The treading of stock on wet ground is very bad for any pasture, if the soil is given no chance to loosen out and become porous again. The spread and damage done by this weed is mainly due to improper pasturage methods. All continually grazed and cropped pastures steadily deteriorate, especially when the practice is added of collecting and carrying away the droppings to cultivated land, instead of spreading the droppings and loosening the soil by the aid of scarifiers. Pasture land which is divided into paddocks by good wind-proof hedges, rested from time to time, enriched with humus instead of being robbed of it, and kept open and pervious by the use of scarifiers, will not be troubled by onion grass to any great extent, will have a less tendency to become tussocky, and will carry twice the amount of stock that one large paddock with continuous grazing and cropping would do. Further, the difference in carrying power will be even more pronounced in times of drought than in winter time.

When the leaves are quite young stock will browse on the onion grass, but they are not fond of it, and as soon as the leaves become adult they are so tough and wiry that the stock often pull up the sods, or draw out their own teeth. Statements are current that lambs eating the leaves become paralysed, and that cockatoos after eating the underground corms become stupified as with a narcotic, but the statements lack scientific confirmation and appear to be based on scanty and not altogether trustworthy evidence. Experimental tests are needed.

Stock Roads and Waste Places.—The latter should wherever possible be covered with trees, preferably quickly growing and closely planted timber trees. The same applies to the former, except that in many cases closely planted acacias would be preferable. They suppress the weed completely, give shade and protection without overshadowing the road too much, yield useful products, bark and wood, and add greatly to the beauty of the roads.

Lawns and Cricket Grounds.—Frequent and close cutting during the growing period, and as long as any flowers appear (May-October) will exhaust the underground corms and prevent the formation of fresh seed. If the ground is trodden and baked hard by trampling in all weathers it must be loosened, a top-dressing of well-rotted stable manure applied, and not rolled too heavily. *Romulea* does not like light porous ground fairly rich in humus. It prefers ground which is dry in summer time but moist in winter.

Parasites.—A fairy ring fungus which forms brown irregular circles in the grass, also grows on and destroys the bulbs, but they soon reappear in the grass behind the rings, and the fungus does more harm to the pasture than it does to *Romulea.* Loosening the soil, and the addition of lime aid in keeping down the fungus.

The plant is proclaimed for the whole State.

TOOWOOMBA CANARY GRASS.

The So-called "Phalaris commutata."

Alfred J. Ewart, D.Sc., Ph.D., F.L.S., Government Botanist and Professor of Botany at the Melbourne University.

This fodder grass has recently been largely advertised as the king of all winter grasses. It is stated to have been first introduced into Australia by Mr. R. Harding, curator of the Botanic Gardens, Toowoomba, Queensland, to whom credit is generally given for its introduction and distribution. Mr. Charles Ross, manager of the State Farm, Westbrook, Queensland, however, informs me that it was introduced into Toowoomba over twenty years ago, when the late Mr. Way was curator of the Botanic Gardens. The seed was received with about sixty other grasses from the Agricultural Department of New York, U.S.A. All the varieties were lost but this one, which existed in out of the way places, such as hedgerows and rubbish-heaps. Mr. Harding drew Mr. Ross' attention to this grass four or five years ago and gave him a root. Recognising its value he (Mr. Ross) at once began to propagate and distribute it. Hence, as is often the case, the credit of introducing and spreading this grass is not solely due to one man but is to be apportioned amongst several.

"*Phalaris commutata,*" is a native of the foothills of the Alps, and other parts of Italy. Mr. Webb, in the Sydney *Daily Telegraph,* 17th June, 1908, stated that this Italian grass was imported from America for the Toowoomba Experimental Farm in 1884, with a lot of other grasses. On account of great drought none did any good and they were thrown away on a rubbish-heap. Some years afterwards a beautiful grass was observed doing well where the roots had been thrown. This was "*Phalaris commutata.*"

In the *Agricultural Gazette of New South Wales,* 1908, page 849, a number of reports from the different agricultural stations are given in regard to its utility for grazing and fodder purposes. The reports are very conflicting, but on the whole it is agreed that it grows well in winter, and up to about December when it seeds. The stems are then rather hard, so that if it is to be used for hay it must be cut early while fresh and green. The flat, succulent leaf is readily eaten by stock, including sheep. Since the plant is not only a perennial but also seeds freely, it should maintain itself well, even under continued grazing. In any case, however, it has still to be shown that it is superior to all or any of the fodder grasses already known and in common use. For permanent pastures it is, for instance, not certain whether it is any better than *Phalaris minor,* a well and long known species of the same genus.

For some time, the National Herbarium has been in doubt in regard to the correctness of the name given to this plant. The Kew Index makes *Phalaris commutata,* Roem. and Schult, a synonym to *Phalaris coeru-*

lescens, and at one time it was thought possible that the plant might prove to be a cross between *Phalaris coerulescens* and *Phalaris arundinacea*. Specimens were sent to Kew Gardens, and to Professor Hackel. The director of the Royal Botanic Gardens, Kew, writes that the plant received for identification is *Phalaris bulbosa*, L. (1755) (synonym, *Phalaris nodosa*, L. (1774). *Phalaris commutata*, Roem. and Schult, is, according to Bertoloni, a composite species described from the base of a specimen of *Phalaris bulbosa*, and an inflorescence of *Phalaris minor*. *Phalaris bulbosa* is a well-known native of the Mediterranean region, but I can find nowhere any account of its properties or usefulness as a fodder grass, and in general the genus *Phalaris* appears to be of more value for its seed (canary seed) than for fodder or grazing purposes. In any case it is doubtful whether the grass would be a suitable one for rotation farming, so that trials in this direction should be conducted with caution. Professor Hackel writes to say that he considers the plant to be a new, undescribed species intermediate between *Phalaris bulbosa* L. and *Phalaris arundinacea*. L. From the latter it is distinguished by the want of subterranean scaly-leaved runners, by the wing on the keel of the sterile glumes, which is, at least 0.4 millimetres broad, (in *Phalaris arundinacea* it is wanting or minute) and by the absence of the three sterile glumes, which are present in *Phalaris arundinacea*. The same character distinguishes it from *Phalaris bulbosa*, which has also much broader wings on the keel of the sterile glume and which has three to four bulbous lowest internodes of the culm. The name of "*Phalaris commutata*" was given by Roem. and Schult, to a plant gathered near Genoa (Italy), and described as having a bulbous culm and the wing of the keel of the sterile glumes *denticulate* (like that of *Phalaris coerulescens* and *minor*). It is possible that *Phalaris commutata* is a synonym of *Phalaris coerulescens*, but Bertoloni says that the specimen was combined of the vegetative parts of *Phalaris bulbosa* and the inflorescence of *Phalaris minor*. Modern Italian botanists have suppressed this doubtful name.

Professor Hackel proposes to give the name of *Phalaris stenoptera*, to this grass, on account of the very narrow wing on the keel of the sterile glumes. There is, therefore, a difference of opinion between two weighty authorities as to whether this grass can be referred to an existing species (*Phalaris bulbosa*) or is an entirely new one, but both agree in suppressing the name of "*Phalaris commutata*." If Professor Hackel is correct and we are dealing with a new species, the question arises as to its origin. Its free powers of seed production point against a hybrid origin, and we have no guarantee that the seed originally imported was pure, or in fact, that the plant with which we are dealing was actually derived from the imported seed at all. The gap of four or five years between the apparent loss of the seed and the reappearance of the plant on a rubbish-heap is a big one, and gives room for many possibilities.

The conveyance of a plant of mixed affinities from one country to another by making its seed develop under varied conditions of environment is especially likely to render it liable to sudden saltatory variations, such as de Vries found capable of producing new species in Oenothera (the evening primrose). Whether we are dealing here also, with a similar case of the sudden evolution of a new species is difficult to say and can only be determined by the cultural experiments, which Professor Hackel now has in progress. If the characters on which he relies remain constant

and run true to seed, it will be difficult to avoid the conclusion that we are dealing with the sudden evolution of a new species induced in a plastic stock by the action of a pronounced change of environment.

No species of *Phalaris* are native to Australia, but we have no information as to the origin and purity of the seed originally received from the United States. In all probability it came from a number of individuals which were not all precisely alike, and possibly were in some cases strongly dissimilar. The plant which succeeded in surviving in the struggle for existence on the rubbish heap would naturally be the strongest and best suited to extreme conditions. For the present judgment must be suspended, but the name of "*Phalaris commutata*" must be at once suppressed, and can be replaced for popular purposes by Toowoomba Grass or Toowoomba Canary Grass, or Queensland Canary Grass, while we still need more precise information as to whether this grass is really superior to those already known and widely used for fodder and winter grazing. Old lamps are sometimes more valuable than new ones, even outside of fairy tales.

Mr. Bailey, Director of the Botanic Gardens, Brisbane, writes to say that so far he has not received authentic Queensland-grown specimens of "*Phalaris commutata.*" Of two specimens received one proved to be *P. arundinacea*, the other *P. nodosa* (*P. bulbosa*). From Mr. Alexander, of Brighton, and from other correspondents, we have received plants of undoubted *Phalaris canariensis* which appeared among the crop of "*Phalaris commutata.*" This is all evidence tending to show that Toowoomba Canary Grass is a mixed hybrid, which tends to revert to its parent forms. We shall be indebted to cultivators of this grass if they would note and forward for examination any abnormal plants with different heads to the rest which may appear among the crop. It may be possible in this way to definitely and decisively determine the real nature or origin of this grass, and whether it is (1) a variety of an existing species (*Phalaris bulbosa* L.), (2) a double hybrid (*P. canariensis arundinacea*), or (3) a new undescribed species (*P. stenoptera Hackel*).

THE ORCHARD.

James Lang, Harcourt.

During the month the weather has been unusually dry. The strong drying winds have caused the evaporation of a lot of moisture from the soil, and as from present appearances the dry weather is likely to continue, it is therefore very needful that the ground should be kept stirred and free from weeds in order to conserve all moisture possible. The fruit crop is not going to be as heavy as was at one time anticipated. Apples and pears have thinned out very much more than they usually do at this time; still there will be a good crop of these fruits. With some varieties the thinning out will be an advantage, as the fruit will mature to a much better size than if there had been an over crop, more especially should the season prove dry. Cherries are now being gathered for market. The crop will be light, many of the varieties not setting so well as usual; in some districts frosts cut them a good deal. Apricots and plums will also be light. This is very disappointing as the trees bloomed well and gave promise of a good crop, and in the case of plums a heavy crop of fruit.

The frost was responsible in many districts for the light crop of plums. Peaches will be about an average crop. Strawberries are now coming into the market, and are more plentiful than they have been for some years.

There will be a large surplus of apples and pears for export, and growers should make arrangements for shipping space sufficient for their requirements as early as possible. If this is not done at once growers may find a difficulty later on in securing the quantity of space they may require. The space available is limited, and not nearly enough for requirements. All growers should ship a portion of their apples in order that a remunerative price may be obtained. The larger the quantity shipped the better for the local market, which will be relieved of a large quantity of apples which would otherwise be sold locally at a very low price.

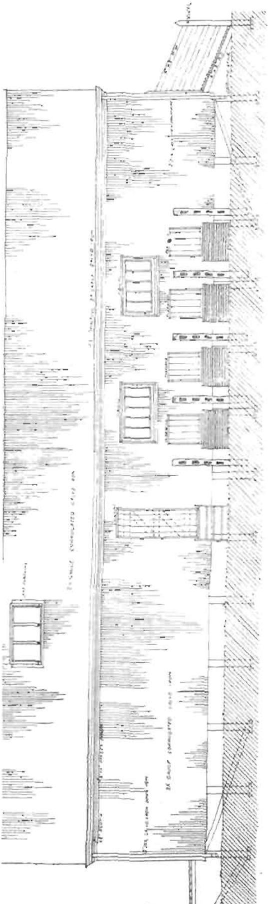
Spraying for Codlin Moth should be carefully attended to. To neglect this means a large percentage of grubby apples, reducing the quantity of marketable apples very considerably. If Black Spot should make its appearance on any of the trees, spray at once with Bordeaux mixture. This will keep it in check and prevent its spread.

SHEARING SHED FOR FOUR SHEARERS.

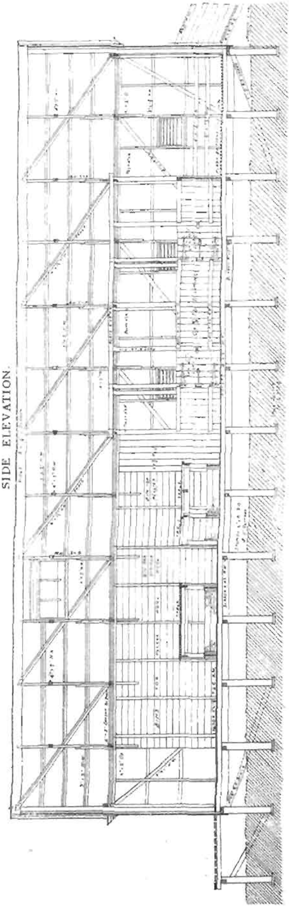
A. S. Kenyon, C.E., Engineer for Agriculture.

Several requests having been made for information regarding the planning and construction of small shearing sheds, the complete working drawings, specification and quantities of a shed suitable for four shearers are here given. Copies of these are now available and may be obtained on application to the Secretary for Agriculture at the cost of Five shillings per set.

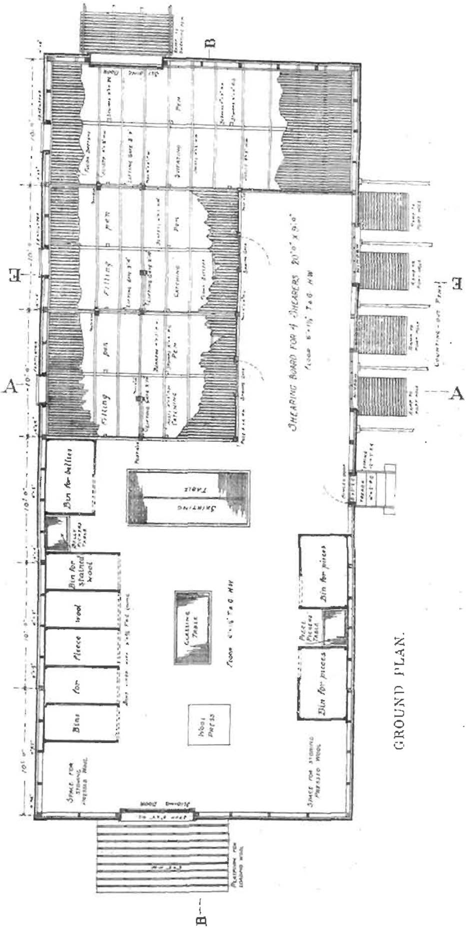
The accompanying illustrations show plan, section and elevation only, and give a fair idea of the dimensions and arrangement. The framework of the building is constructed of hardwood on redgum stumps and sole plates, and the walls and roof are covered with 26 gauge corrugated galvanized iron. The level of the floor is 2 ft. 5 in. above ground level to allow the sheep droppings to be raked out from under the pens, and to insure a free circulation of air under the floor. The floor area is 60 ft. by 25 ft. one half of which would be occupied by the shearers and sheep, and the other half by the wool-classers. The half to be occupied by the shearers is divided into a shearing board and pens. The area of the shearing board is 20 ft. by 9 ft., giving a space of 9 ft. by 5 ft. for each shearer, which allows sufficient passage way for the boy carrying the wool and the tar without inconvenience to the shearers. At the back of the shearing board are two catching pens which will hold 24 sheep each, one pen supplying two shearers. The catching pens are connected with the shearing board by a hinged door furnished with a strong spring. The door opens on to shearing board, which enables the shearer, after catching his sheep to back out, when the door will immediately close by means of the spring as soon as the shearer is clear of it. In the wall opposite each shearer is a port hole, closed by a sliding door, through which the sheep is passed into the counting-out pen after having been shorn. The shearing board is lighted by two lifting sashes, each 4 ft. 6 in. wide by 2 ft. 6 in. high. In addition to the two catching pens are two filling pens to hold 24 sheep each, and a sweating pen to hold 80 sheep. The pens are divided by railings 3 ft. 6 in. high and are connected with one another by light strong gates. The gates are secured at one of the bottom



SIDE ELEVATION.



SECTION B.B.



GROUND PLAN.

SHEARING SHED FOR FOUR SHEARERS.

corners by a bolt, round which they work, being lifted by the upper corner diagonally opposite to the bolt and working in a guide. This gate can be opened or shut with ease, no matter how full of sheep the pens may be. The pens are ventilated by means of louvred ventilators, the louvres of which can be regulated to suit weather conditions. The floor joists of the pens are covered with 2 in. by 2 in. battens spaced 2⅝ in. centres. The battens have their upper angles slightly chamfered and one side bevelled so that the droppings can easily pass between them to the ground below. The floor joists of the remaining portion of the shed are covered with 6 in. by 1⅛ in. tongued and grooved flooring having the nails well punched and the boards cleaned off. The divisions between the pens and shearing board and the pens and wool classing portion are sheeted with 6 in. by ⅞ in. lining (in order to obstruct the sheep's view of these parts of the building and consequently keep them quiet) and have only two rails. The remaining divisions have four rails and are left open. To prevent the sheep when closely packed in the pens from being caught against the studs of the outer walls, two horizontal rails are planted on to the studs, the top rail being fixed about the height of a sheep.

The wool classing portion of building contains along one side a space for storing pressed wool, four bins for fleece wool each 6 ft. by 3 ft., one similar sized bin for stained wool, and a belly picker's table with a 6 ft. x 4 ft. bin alongside. The space on this side for storing pressed wool may be used for extra bins if necessary. On the other side is a space for storing pressed wool, and a piece picker's table with a 6 ft. by 4 ft. bin on each side. In the centre space are the skirting table, classing table, and wool press. The studs at the back of bins are lined with 6 in. x ⅝ in. white deal, tongued and grooved and beaded, of which material the bins are chiefly constructed. All these fittings are arranged in the most convenient positions for their various uses. Ample space is left round the wool press and the skirting and classing tables. This half of the building is lighted by means of two skylights giving a good top light on to each table and into bins. The tables are constructed of oregon, with battened tops and rounded edges of deal. The battens are 1⅜ in. by ¾ in. on edge, spaced 1⅛ in. centres, with top rounded.

There are three doors to the building. A small hinged door for general use of those employed in the building, is placed in a position convenient both for shearers and wool classers. A large sliding door is placed at each end of the building. The doorway at the wool classing end leads on to a platform for loading wool. The one at the other end is for the entrance of the sheep, and leads on to a battened ramp connected with a sweating shed which in its turn is connected with the drafting yards. It is difficult to estimate the exact cost of this building, as so much depends on the locality in which it is to be erected. The price in Melbourne would be approximately £320.

This shed (which is for a flock up to 4,000 sheep) being built in 10 ft. sections, can be easily reduced or increased to suit the number of sheep to be shorn, without interfering with the general arrangements or construction. If less than 1,500 sheep are to be shorn, the length of the building could be reduced 20 ft. by cutting out half the shearing board and the pens behind, and by taking 10 ft. off the wool classing portion. This would effect a saving of about £65. Each additional 10 ft. added (at a cost of about £40) to the shearing board portion of shed would allow 2,000 more sheep to be shorn up to 8,000 in all without any increase of the wool classing portion being necessary nor need the sweating pen be larger.

LAMBS FOR EXPORT.—CAUSES OF REJECTS.

H. W. Ham, Sheep Expert.

Farmers in the lamb-raising industry are sometimes disappointed with the average price paid and the number of rejects made by export buyers each year. Some farmers, and buyers too, hold that these rejects will do again for lamb raising. If the rejection is on account of want of condition, owing to the season or bad feeding, it may be so, but if carelessly bred in the first place then they can never possibly be good lamb raisers. It is only too plain, however, that when our lambs are at their primest and in greatest numbers there are not sufficient works or cool storage to promptly deal with and hold them. Farmers are then told that the lambs are not ready, and have to wait until their lambs are past their best in sappiness and quality. At the same time it has to be admitted that with many farmers the fault lies with the breeding of the lambs more than with the man rejecting them.

Too many farmers breed second quality. Many more spoil their lambs in the feeding. What they term "stocking up" is responsible for much of this, sometimes in tricky seasons through no fault of the farmer but mostly in good seasons when the temptation of luxuriant herbage is great. Others give the animals no chance by forcing ewes and lambs to clean out cultivation and fallow paddocks. This condition of things will always exist to a greater or less extent; all have to learn by experience, and for those who believe in what they call "a little dealing" the danger of being caught is always present.

A matter, which up to the present many farmers have not given sufficient thought to, is the secondary result obtained by mating certain breeds and grades of ewes with rams of such a class that the result cannot be satisfactory. Thick-set sappy lambs stand knocking about in trucks and yards with a minimum of damage. Lambs when full of grass may look well in the paddock, but often the dressed carcass shows very little thickness through the fore-quarter. Lambs of this kind quickly lose whatever little bloom they may have had when they left the paddocks. Small merino ewes, especially if the fleece is marked by extreme density and head covering, are best mated to the smaller boned, neater headed and bare pointed Leicesters. The latter should, however, be shapely and well woolled, and not some of the thin locked and wasty fleeced sorts that are all too common in the country. This useful breed is at present undergoing a mild boom.

Our best thriving breeds are the Downs and the best fleeced of these are the Shropshires. But when joined with merino ewes, especially the station culls that the farmer too often gets hold of, these lambs are only second rate freezers at best, for merino ewes are not the best of milk givers. They are also the worst of wool cutters if held over, as a lot of them have to be.

The Shropshire is only a fair woolled breed, and these ewes are culled for being either inferior or light woolled. No class of sheep is less profitable than cull merinoes, for they are culled for ill shapes as well as for poor fleeces, and this means ill doers and bad milkers. The lambs cannot inherit any useful wool-cutting qualities, and have only the sire to give better constitutional shape. but this is counteracted by the dam being a poor doer, and consequently a poor milker.

After all, the ewe has to carry the lamb and then rear it, and as regards freezing lambs, the ewes have more to do with the success of them from start to finish than the ram. One starts it, the other finishes it. Good

sorts of well grown merino ewes should go to thick set, good fleeced Lincoln rams.

Good sorts of coarse Lincoln-merino ewes should go to good shaped Downs rams for farmers raising export lambs, and to level made plain bodied merino rams for woolgrowers.

This country is one of the very best for lamb raising. But all the natural advantages and best of feed will not make prime quality lambs, unless they are reared from roomy good shaped ewes and begot by level made rams of a breed suited to correct whatever faults the ewes are inclined to.

MERINO RAMS.

(Continued from page 651.)

The horns of ram lambs should be cut when weaned, an ordinary pair of bull-nosed hedge cutters answering the purpose. If allowed to go later they will pluck the wool from each other, especially if they have to be yarded or fed at troughs in severe autumns. Starlings are often blamed for such plucks caused by sharp pointed horns, and rats and mice have been blamed for the same thing when rams have been housed and penned together in sheds over night. If ram lambs about the age of three to four months are in the yard for any purpose their horns can then be cut with a strong pocket knife. They are soft and cut easily.

Close horned rams are an evil, as they are responsible for wethers with horns growing into the eyes and jaws. Close horned rams are also often narrow framed. With a special stud ram the horns should stand out from the cheek from two to three inches, and be as nearly as possible parallel with the cheek bone. In full wool there should be room to run the fingers round easily between the wool and the horn. If a two-tooth ram shows signs of close horns he will be worse when older. Ugly as an extremely wide horned ram may appear, he is preferable to a narrow horned one. The size of horn should be in proportion to the size of the ram. A light effeminate horn is objectionable and so is a coarse heavy horn. Extremes in either case are evils.

There are horns showing good breeding, but this varies with age, a young ram not showing to advantage in this respect beside a four or five year old.

Before joining rams with the ewes, it is as well to see that their hoofs are the natural shape. In most sheep districts where there is not sufficient grit in the ground to keep the feet worn into shape they grow long, and rams with long toes are at a disadvantage in following up or teasing ewes. Any deformed feet should be cut into their natural shape, with a strong foot-rotting knife, or with a strong pair of secateurs.

The wool from about the pizzle should be cleared away thoroughly, *especially in burry country. It is always difficult to get shearers to clear* the wool thoroughly from about the eyes, tails, and pizzles of ram lambs. In most cases this ought to be done within a few weeks after shearing. Where men are available, stud lambs can be gone through in the count out pens or the branding race at shearing time. However bad they may have been left by the shearers this opportunity should be taken to have them properly cleaned about the tails and eyes.

Rams passed before shearing for carrying an even fleece of the correct class of combing wool should after being shorn be again run through the yards. Those that are unshapely and show signs of weakness about the forequarters should then be finally discarded.—H.W.H.

Artificial Manures Acts.

LIST SHOWING RESULTS OF ANALYSES OF SAMPLES OF ARTIFICIAL MANURES COLLECTED IN THE STATE OF VICTORIA UNDER THE PROVISIONS OF THE ARTIFICIAL MANURES ACTS.

Label No.	Official No.	Description of Manure.	Manufacturer or Importer.	Moisture.	Nitrogen.		Phosphoric Acid.		Mechanical Condition.				Net Weight Found.	Net Weight Guaranteed.	Estimated Value per ton.
									Fine.		Coarse.				
					Found.	Guaranteed.	Found.	Guaranteed.	Found.	Guaranteed.	Found.	Guaranteed.			
				%	%	%	%	%	%	%	%	%	lbs.	lbs.	£ s. d.
442	22451	Blood and Bone ..	Angliss and Co., Melbourne ..	19.09	4.66	5.60	15.58	15.01	21.50	34.00	78.50	66.00	*	187	5 3 1
469	22475	Fertilizer	Thos. Borthwick and Sons, Melbourne	2.65	4.73	5.50	18.44	8.00	46.00	50.00	54.00	50.00	*	224	5 19 3
490	22476	Bonedust	,, ,, ,, ,,	3.05	3.97	2.25	23.69	25.00	60.50	50.00	39.50	50.00	*	224	6 13 6
500	22477	,, ...	J. Brown, Hamilton	6.92	3.24	3.15	24.07	22.00	38.50	33.00	61.50	67.00	*	224	6 2 9
451	22455	,, ...	Cuming, Smith, and Co., Melbourne	5.94	3.50	3.00	18.96	18.00	38.50	35.00	61.50	65.00	*	224	5 6 7
477	22632	,, ...	,, ,, ,, ,,	7.95	2.71	3.00	17.66	18.00	42.00	35.00	58.00	65.00	*	224	4 14 1
447	22450	,, ...	J. A. Dundas, Footscray ..	16.06	3.48	3.00	13.50	18.31	20.50	..	79.50	..	*	224	4 3 6
438	22457	,, ...	J. R. Elsworth, Ballarat ..	7.29	3.08	3.72	19.39	21.50	30.00	44.50	70.00	55.50	*	224	5 2 4
453	22458	,, ...	,, ,, ,, ..	11.99	3.02	3.72	19.66	21.50	42.00	44.50	58.00	55.50	*	224	5 4 10
475	22459	,, ...	,, ,, ,, ..	10.12	2.88	3.72	20.44	21.50	35.00	44.50	65.00	55.50	*	224	5 5 1
478	22472	,, ...	,, ,, ,, ..	11.52	3.05	3.72	18.07	21.50	35.50	44.50	64.50	55.50	*	224	4 18 1
486	22634	,, ...	,, ,, ,, ..	9.38	3.23	3.72	19.26	21.50	44.50	44.50	55.50	55.50	*	224	5 5 11
493	22484	,, ...	,, ,, ,, ..	8.48	4.22	3.72	18.27	21.50	34.50	44.50	65.50	55.50	*	224	5 10 10
440	22454	,, ...	H. J. Feore and Co. Richmond ..	13.61	2.39	2.43	13.61	16.28	32.00	..	68.00	..	*	112	3 14 5
452	22479	,, ...	,, ,, ,, ..	6.64	2.60	2.43	16.87	16.28	36.00	..	64.00	..	*	112	4 9 0
465	22468	,, ...	Geo. Gardiner, Geelong	9.35	2.78	3.00	18.95	16.17	37.00	21.00	63.00	79.00	*	112	4 18 10
480	22480	,, ...	,, ,, ,, ..	15.06	7.33	3.00	11.84	16.17	25.00	21.00	75.00	79.00	*	112	5 17 2
489	22461	,, ...	J. B. Jopling, Ballarat	11.04	3.48	4.25	21.86	22.20	32.50	6.55	67.50	93.45	*	224	5 16 0
467	22470	Bonedust (Waddell) ..	J. Kitchen and Son, Melbourne ..	8.81	2.92	3.00	19.37	18.00	37.00	38.00	63.00	62.00	*	112	5 1 9
474	22466	,, ,, ..	,, ,, ,, ..	10.66	3.20	3.00	19.47	18.00	28.00	38.00	72.00	62.00	*	112	4 14 0
481	22467	,, ,, ..	,, ,, ,, ..	8.24	3.17	3.00	19.32	18.00	35.00	38.00	65.00	62.00	*	224	5 3 10
361	21072	Bonedust	J. Little and Son, Ararat ..	6.51	4.22	3.46	18.07	22.98	46.00	57.10	54.00	42.90	*	224	5 12 5
473	22465	Blood and Bonedust ..	E. L. Lloyd, Box Hill	20.27	2.38	4.50	10.75	18.00	38.00	..	62.00	..	*	112	3 4 6
404	21747	Bonedust	Milo Bacon Coy., Echuca ..	7.00	4.91	3.58	15.76	16.20	34.00	46.80	66.00	53.20	*	224	5 8 7
335	21653	,, ...	Mt. Lyell M. and R. Coy., Melbourne	5.84	3.12	3.00	18.94	18.00	43.00	38.00	57.00	62.00	225	224	5 3 4
458	22630	,, ...	,, ,, ,, ..	9.57	3.55	3.50	19.63	19.00	34.00	38.00	66.00	62.00	*	224	5 8 8
479	22633	,, ...	,, ,, ,, ..	8.72	3.29	3.00	20.08	18.00	28.00	38.00	72.00	62.00	*	224	5 6 8
485	22483	,, ...	Renard Fertilizer Coy., Melbourne	9.04	3.52	3.00	19.20	18.00	30.50	38.00	69.50	62.00	*	224	5 6 3
476	22631	,, ...	P. Rohs, Bendigo	7.14	4.24	4.28	21.54	23.45	27.50	22.70	72.50	77.30	*	224	6 1 7
889	21701	,, ...	,, ,, ...	13.00	4.21	4.28	20.53	23.45	30.00	22.70	70.00	77.30	*	224	5 18 1

* Not weighed.

LIST SHOWING RESULTS OF ANALYSES OF SAMPLES OF ARTIFICIAL MANURES, ETC.—*continued.*

Label No.	Official No.	Description of Manure.	Manufacturer or Importer.	Moisture.	Nitrogen.		Phosphoric Acid.								Potash.		Net Weight found.	Net Weight Guaranteed.	Estimated Value per Ton.
							Water Soluble.		Citrate Soluble.		Insoluble.		Total.						
					Found.	Guaranteed.	Found.	Guaranteed.	Found.	Guaranteed.	Found.	Guaranteed.	Found.	Guaranteed.	Found.	Guaranteed.			
				%	%	%	%	%	%	%	%	%	%	%	%	%	lbs.	lbs.	£ s. d.
462	22463	Sulphate of Ammonia ..	Cuming, Smith, and Co., Melbourne	..	20.79	20.00	..	..	..	..	..	..	..	..	..	..	*	224	14 11 0
463	22464	Sodium Nitrate ..	,, ,, ,,	..	15.46	15.50	..	..	..	..	..	..	..	..	..	..	*	224	13 2 10
392	21734	Potash Chloride (Muriate)	,, ,, ,,	..	..	..	..	..	..	..	..	..	..	..	62.30	61.19	*	224	17 2 8
412	21749	Superphosphate, Federal	Australian Explosives and Chem. Coy., Melbourne	5.02	..	..	14.63	17.00	3.69	1.00	1.21	2.00	19.53	20.00	..	..	*	224	4 5 6
396	21738	Superphosphate, Florida	Cuming, Smith, and Co., Melbourne	8.51	..	..	16.47	17.00	1.69	1.00	3.34	2.00	21.50	20.00	..	..	224	224	4 8 4
408	21757	,, ,,	,, ,, ,,	9.70	..	..	17.28	17.00	1.13	1.00	4.60	2.00	23.01	20.00	..	..	220	224	4 11 2
415	21752	,, ,,	,, ,, ,,	9.23	..	..	17.90	17.00	0.60	1.00	2.50	2.00	21.00	20.00	..	..	224	224	4 9 11
434	21777	,, ,,	,, ,, ,,	10.19	..	..	17.52	17.00	0.71	1.00	3.02	2.00	21.25	20.00	..	..	*	224	4 9 1
466	22469	,, ,,	,, ,, ,,	12.18	..	..	15.90	17.00	1.05	1.00	5.75	2.00	22.70	20.00	..	..	*	112	4 5 6
432	21772	Superphosphate, No. 1	Colonial Manures Coy., Melbourne	8.07	..	..	16.45	17.00	1.69	1.00	2.34	2.00	20.48	20.00	..	..	*	224	4 7 3
482	22481	,, ,, ..	,, ,, ,,	9.16	..	..	17.38	17.00	1.32	1.00	3.06	2.00	21.76	20.00	..	..	*	224	4 10 11
399	21740	,, ,,	Mt. Lyell M. and R. Coy., Melbourne	10.42	..	..	16.78	17.00	2.26	1.00	2.33	2.00	21.37	20.00	..	..	225	224	4 11 1
401	21742	,, ,,	,, ,, ,,	7.15	..	..	18.45	17.00	1.78	1.00	1.99	2.00	22.22	20.00	..	..	224	224	4 16 10
409	21758	,, ,, ..	,, ,, ,,	8.05	..	..	15.60	17.00	3.28	1.00	2.26	2.00	21.14	20.00	..	..	227	224	4 9 6
492	22462	,, ,, ..	,, ,, ,,	11.88	..	..	17.28	17.00	1.51	1.00	2.68	2.00	21.47	20.00	..	..	*	224	4 10 10
400	21741	Superphosphate, No. 1 Standard Flag Brand	Renard Fertilizer Coy., Melbourne	9.68	..	..	17.14	17.00	1.42	1.00	1.02	2.00	19.58	20.00	..	..	223	224	4 8 1
406	21755	,, ,, ,,	,, ,, ,,	9.82	..	..	16.85	17.00	1.97	1.00	1.35	2.00	20.17	20.00	..	..	221	224	4 9 3
413	21750	,, ,, ,,	,, ,, ,,	12.38	..	..	16.48	17.00	3.07	1.00	1.77	2.00	21.32	20.00	..	..	*	224	4 12 3
416	21753	,, ,, ,,	,, ,, ,,	10.13	..	..	16.76	17.00	2.57	1.00	1.81	2.00	21.14	20.00	..	..	224	224	4 11 8
324	21713	Superphosphate, No. 1 ..	Wischer and Co., Melbourne	7.05	..	..	14.49	17.00	2.06	1.00	1.45	2.00	18.00	20.00	..	..	221	224	3 18 7
403	21746	,, ,, ..	,, ,, ,,	6.00	..	..	14.84	17.00	2.49	1.00	2.48	2.00	19.81	20.00	..	..	*	224	4 2 11
411	21748	,, ,, ..	,, ,, ,,	5.16	..	..	19.39	17.00	1.79	1.00	1.86	2.00	23.04	20.00	..	..	*	224	5 1 1
418	21761	,, ,, ..	,, ,, ,,	7.84	..	..	17.74	17.00	2.10	1.00	1.76	2.00	21.60	20.00	..	..	*	224	4 14 5
472	22471	,, ,, ..	,, ,, ,,	8.92	..	..	17.39	17.00	1.89	1.00	3.09	2.00	22.37	20.00	..	..	*	224	4 13 3

414	21751	Dissolved Bones ..	Cuming, Smith, and Co., Melbourne	12.57	1.09	1.00	10.08	10.01	3.77	3.88	7.62	5.48	21.47	19.37	..	..	224	224	5	1	4
421	21763	" " ..	" " "	8.30	1.03	1.00	10.79	10.01	6.71	3.88	3.85	5.48	21.35	19.37	..	..	*	224	5	2	8
309	21722	" " ..	" " "	7.86	1.59	1.00	10.00	10.01	5.23	3.88	5.81	5.48	21.04	19.37	..	..	225	224	5	5	10
498	22485	" " ..	" " "	10.49	0.86	1.00	11.50	10.01	6.48	3.88	2.65	5.48	20.63	19.37	..	..	*	224	4	19	1
410	21759	Bonedust and Superphosphate	" " "	11.18	1.72	1.50	7.94	8.50	6.31	0.50	5.79	10.00	20.04	19.00	..	..	220	224	5	1	9
488	22460	" " "	" " "	7.18	1.55	1.50	7.28	8.50	8.17	0.50	5.43	10.00	20.88	19.00	..	..	*	224	5	2	11
419	21743	" " "	Colonial Manures Coy., Melbourne	4.86	1.45	1.50	7.82	8.50	4.40	0.50	4.42	9.00	16.64	18.00	..	..	222	224	4	5	10
444	21783	" " "	J. A. Dundas, Footscray	11.47	1.48	1.50	8.80	6.12	4.00	8.26	5.12	2.82	17.92	17.20	..	..	*	112	4	11	6
468	22474	Bonedust and Superphosphate, No. 3	Mt. Lyell M. and R. Coy., Melbourne	9.79	0.84	0.80	6.57	12.75	8.96	1.00	4.02	5.75	19.55	19.50	..	..	*	224	4	10	1
417	21760	Blood, Bonedust, and Superphosphate	Wischer and Co., Melbourne	7.36	3.26	2.63	7.33	8.50	5.67	0.50	4.63	5.50	17.63	14.50	..	..	*	224	5	8	8
429	21771	Nitro Superphosphate ..	" " "	8.14	2.31	1.88	10.71	12.75	3.55	0.75	1.63	1.50	15.89	15.50	..	..	*	224	4	11	0
433	21776	Bonedust and Superphosphate	" " "	7.79	1.42	1.50	5.08	8.50	7.55	0.50	4.59	10.00	17.22	19.00	..		*	224	4	5	8
319	21708	Thomas' "Star" Phosphate and Superphosphate	Colonial Manures Coy., Melbourne	5.45	..	..	5.14	5.00	11.93	11.00	0.79	1.50	17.86	17.50	..	..	227	224	3	11	11
348	21667	" " "	" " "	3.51	..	..	5.57	5.00	11.26	11.00	0.88	.50	17.71	17.50	..	..	228	224	3	14	7
368	21684	" " "	" " "	4.96	..	..	5.01	5.00	11.24	1.00	0.90	.50	17.15	17.50	..	..	*	224	3	11	11
371	21682	" " "	" " "	3.47	..	..	2.69	5.00	13.08	11.00	1.53	.50	17.30	17.50	..	..	*	224	3	10	5
420	21762	" " "	" " "	3.51	..	..	1.36	5.00	13.67	11.00	1.66	.50	16.69	17.50	..	..	*	224	3	7	0
428	21770	" " "	" " "	7.21	..	..	5.66	5.00	10.36	11.00	1.61	.50	17.63	17.50	..	..	*	224	3	14	0
464	22629	Potato Manure ..	Cuming, Smith, and Co., Melbourne	11.75	1.02	1.20	15.39	14.62	2.25	0.86	2.43	.72	20.07	17.20	3.61	4.15	*	224	6	4	8
435	21778	Grass Manure ..	" " "	7.68	0.85	0.70	16.46	16.40	1.96	0.97	5.79	1.93	24.21	19.30	..	..	*	224	5	18	2
461	22473	Phospho Kainit ..	Colonial Manures Coy., Melbourne	1.88	..	..	..	..	1.35	9.80	12.88	2.10	14.23	11.90	2.26	2.50	*	224	3	2	11
460	22628	Potato Manure ..	Mt. Lyell M. and R. Coy., Melbourne	5.87	1.14	1.20	12.92	14.50	2.85	1.00	1.81	1.70	17.58	17.20	4.31	4.15	*	224	5	18	9
484	22482	Pea Manure	Renard Fertilizer Coy., Melbourne	7.02	0.53	0.60	0.72	5.95	11.58	5.95	2.20	1.90	14.59	..	3.20	2.93	*	224	4	1	0

* Not weighed.

Government Laboratory,
18th November, 1908.

P. RANKIN SCOTT,
Chemist for Agriculture.

DISEASES OF THE BLOOD AND CIRCULATORY ORGANS.

S. S. Cameron, M.R.C.V.S., Chief Veterinary Officer.

ANÆMIA—PLETHORA—LEUCÆMIA—HYPERÆMIA OF CONGESTION—APOPLEXY—INFLAMMATION—THROMBOSIS—EMBOLISM—DROPSY, Œdema, Anasarca, Ascites, &c.—TOXÆMIA OF BLOOD POISONING, Sapræmia, Septicæmia, Pyæmia—UREAMIA—JAUNDICE OF ICTERUS—RHEUMATISM—HEART AFFECTIONS—ANEURISM—PHLEBITIS.

There are many diseases in which alteration of the blood is a feature, but there are singularly few affections of the blood *per se*, that is few diseases in which the blood alone is concerned, or in which it is concerned except as a result of other diseases or extraneous influence. Such diseases as tick fever (piroplasmosis) and the various trypanosomiases (surra, nagana, or tse-tse fly disease, &c.) produce their most marked features on or in the blood, but as they are due to the introduction of a "contagium" they will be more fittingly considered in the chapter on contagious and infectious diseases.

There are however many non-specific and abnormal conditions of the blood and blood vessels, a knowledge of which is essential to the understanding of the diseases with which they are associated. To these abnormal conditions reference will therefore be advantageous.

Anæmia.

This term means literally "bloodlessness" and indicates a deficiency of blood; not necessarily a deficiency in amount but rather a defect in quality—a diminution in number of blood cells (red or white or both) or in amount of the oxygen-carrying element, hæmoglobin. After severe hæmorrhage and during convalescence from acute fevers the blood is deficient in quality; it quickly regains normality in quantity, even after great loss of blood, owing to absorption into it of the required fluid from the tissues or cavities of the body.

Anæmia is usually accompanied by a decrease in vital energy. The pulse and heart's action is feeble and irregular; the visible mucous membranes are pallid; coldness of the extremities and surface of the body with a harsh staring coat and tight skin are common features. There may be loss of appetite and there is more or less wasting of the tissues so that the animal becomes poor in condition and languid or excitable in temperament. If there is excess of watery fluid in the blood dropsical effusions into the skin (called ANASARCA) or into the cavities and most depending parts of the body (called ASCITES or dropsy) may occur. Such dropsical conditions associated with anæmia are common in sheep when affected with "fluke."

Blood tonics consisting of iron compounds (sulphate or citrate of iron) and vegetable bitters (gentian or cinchona) are appropriate and useful medicaments in anæmia.

Plethora.

This is the opposite condition to anæmia; one in which there is increase of the red and white corpuscles and excess of nutritive material. It results from excess of assimilation of food over waste, accompanied by high activity of the blood forming organs. There is fulness of blood, denoted

by heightened colour of the visible mucous membranes, but not necessarily increased vigour either of the circulation or the body generally. The pulse is usually full and strong and there is a tendency to lay on fat. Plethora is only untoward when it is carried to excess in which case the tendency to internal congestions and hæmorrhages (apoplexy) and to acute inflammatory affections is great.

TREATMENT should aim at a diminution of the amount of nutritive material carried into the blood. This may be brought about by limiting the diet or by giving the laxative medicine. Active treatment of congestion resulting from plethora would include blood letting (see page 61, Vol. V.)

Leucæmia.

This condition, also called leucocythæmia, is "characterized by a considerable increase in the number of white corpuscles in the blood, by diminution in that of the red corpuscles, and by changes in the spleen, lymphatic glands, bone-marrow and other organs." (*Green*). It has been but rarely observed in the lower animals. By "leucocytosis" is meant an increase of the number of white corpuscles only without any other change.

Hyperæmia or Congestion.

HYPERÆMIA OR CONGESTION is an excess of blood in the more or less dilated vessels of a part, and according as it is the arteries or the veins that are engorged the terms active congestion (arterial hyperæmia) and passive congestion (venous hyperæmia) are applied. In active congestion the engorgement of the vessel with blood is always accompanied by an acceleration of flow, while in venous congestion the flow is retarded. Congestion is the premonitory stage of inflammation.

Various organs of the body, particularly the lungs and liver, are liable to congestion, constituting definite disease of the organs which will be dealt with along with the other diseases of such organs.

Apoplexy.

APOPLEXY in a general sense consists in a rupture of the wall of a blood vessel with exudation of blood. It frequently follows on an exaggerated condition of hyperæmia the vessels of the brain and lungs being most liable. Apoplexy is not always the result of engorgement; it may be brought about by a weakening or diseased condition of the wall of the blood vessel.

Inflammation.

INFLAMMATION is modernly described as "the reaction of the tissues to irritation." It is primarily however a process in which a change takes place in the wall of the blood vessels of the inflamed part and in the behaviour of the blood in such vessels. The various processes which constitute the phenomena of inflammation are always the result of *irritation*; and it is this fact that irritation is essential which constitutes the difference between inflammation and other pathological processes, *e.g.*, tumour formaton, atrophy, gangrene, degenerations, &c.

The successive stages in the process of inflammation are: *Dilatation* of the vessel with *acceleration* of the flow of blood (the stage of congestion or hyperæmia). The dilatation continues but *retardation* of flow shortly commences. This is followed by *oscillation* of practically stagnant blood which culminates in actual *stasis* or stoppage of flow. In severe inflammation a further stage may be reached, that of *thrombosis* or clotting of the blood within the vessel. From the time retardation commences the concomitant process of *exudation* may proceed. Through the stretched but unruptured wall of the dilated vessel the fluid of the blood (liquor sanguinis) commences to exude and it may be accompanied by the exudation or *diapedesis* of white corpuscles. At a later or more severe stage exudation of red corpuscles may occur.

Inflammation is always accompanied by certain physical signs, viz., redness, heat, swelling, pain, tenderness and impaired function. The *redness* and *heat* depend upon the increased quantity of blood contained in the inflamed part. The *swelling* is due mainly to the exudation of fluid and corpuscles into the tissues of the inflamed part. *Pain* and *tenderness* are due to the pressure exerted by the exuded material on the sensory nerve filaments of the part and perhaps in some measure to chemical irritation of them. *Impaired function* is a result of the injury and lessened vitality of the inflamed tissues and is proportional to the damage sustained by the functional cells of the part.

There are certain varieties of inflammation which are frequently referred to in the description of diseases and which therefore it will be advisable to indicate briefly :—

(1) CATARRHAL INFLAMMATION in which the exudate is watery or "mucoid" and has little or no tendency to coagulate; a good example is the inflammation of the mucous membranes of the nasal and respiratory passages in an ordinary "cold" or catarrh.

(2) CROUPOUS INFLAMMATION, the exudate in this case containing the fibrin-forming elements of the blood along with white corpuscles so that it coagulates readily and forms a firm infiltrate in the tissues or deposit on the surface involved.

(3) DIPHTHERITIC INFLAMMATION somewhat similar to croupous, occurring usually on mucous surfaces and differentiated by the fact that the coagulated exudate never becomes vascularized but quickly undergoes necrosis or death, forming on mucous surfaces what is known as a "false membrane."

(4) SEROUS INFLAMMATION occurring usually on serous membranes but also in other tissues when the irritation is slight, and in which the serum of the blood is alone exuded.

(5) FIBRINOUS, PRODUCTIVE OR PROLIFERATIVE INFLAMMATION, which occurs mostly in connective tissues and in which the exudate shows a tendency to become organized or vascularized and to develop into fibrous tissue through the exuded white cells becoming transformed into connective tissue fibres. Thickenings of tendons, callous swellings, tumour-like growths from collar pinches and the encapsulation or encysting of tubercular or other growths are all good examples of this variety of inflammation.

(6) SUPPURATIVE INFLAMMATION is perhaps not strictly a variety of inflammation, as suppuration only occurs when the inflammatory exudate becomes contaminated with suppurative organisms.

Terminations of Inflammation.—Serous and catarrhal inflammations usually terminate by RESOLUTION, that is, the exudation ceases and

the exuded fluid is either reabsorbed by the blood vessels or is removed by the lymphatic vessels, or, if on a free surface by being discharged from it. Croupous inflammation may also terminate in resolution, the process in this case involving the solution or liquefaction of the exudate and its removal by absorption as in the case of serous and catarrhal exudates; or ENCAPSULATION may occur by the formation round the exudate of a wall of fibrous tissue resulting from a zonary productive inflammation.

CASEATION, a process by which the exudate and tissues become changed into a cheesy looking mass consisting of dead cell *débris* and organic salts, is also a common termination of croupous inflammation in some animals and particularly in fowls. The termination of a productive inflammation can scarcely be said to occur; in that, the newly formed and organized tissue is seldom wholly removed. It usually undergoes a shrinking process called CICATRICIAL CONTRACTION. Surface inflammation may end in ULCERATION, a process in which there is a tendency to the production of molecular death or necrosis of the tissues involved, and which therefore results in the gradual destruction of tissue.

The TREATMENT and control of inflammation in various tissues and organs will be touched on wherever inflammatory diseases are discussed throughout this treatise.

Thrombosis.

By THROMBOSIS is meant " the coagulation of the blood within the blood vessel during life. The product is called a *thrombus* in opposition to a *coagulum* or *clot* which is the result of post mortem coagulation " (*Green*). Thrombosis is most common in veins and is usually due to injury or disease of the vessel wall. Rupture, tearing, twisting or ligature of a vessel will cause a thrombus to form at the seat of the injury; or the presence of a foreign body (an *embolus*) in the vessel will excite thrombosis.

Thrombosis may result in permanent obliteration and " cording " of the vessel, as seen oftentimes in the jugular vein after the operation of blood-letting. Frequently however the thrombus undergoes softening and is removed by the blood stream without any permanent injury being sustained by the vessel.

Thrombosis of the iliac arteries is an occasional cause of obscure hind limb lameness in the horse.

Embolism.

" EMBOLISM is the impaction of solid substances, circulating in the blood, in vessels which are too small to allow them to pass. A mass thus arrested is termed an *embolus* " (*Green*). Fragments of thrombi or of inflammatory or tumour growths, parasites and their eggs, globules of fat and of air and masses of micro-organisms are amongst the common sources of emboli. They are carried along by the current of the blood stream until they become blocked in a narrowing vessel or at a bifurcation or by a vein valve. Acting as a foreign body they cause the formation of a thrombus which frequently extends both in front and behind as far as the junction of the blocked vessel with some other through which the blood is flowing. In small vessels they cause a complete stoppage of the circulation and hence they have often serious results; as for example when the blood vessels of the brain are concerned.

Dropsy.

Œdema, Anasarca, Ascites, Etc.

Dropsy is a condition in which the lymph or fluid portion of the blood is retained in the cavities of the body or in the tissue. The term œdema applies to dropsy of the connective tissue spaces, while anasarca is œdema limited to subcutaneous tissues. Of the dropsies of the serous cavities, ascites refers to peritoneal or abdominal cavity, hydrothorax to the pleural or chest cavities, hydrocephalus to the arachnoid cavity in the brain, hydrocele to the cavity of the tunica vaginalis surrounding the testicle, and hydrops pericardii to the pericardium or heart sac.

Dropsical conditions may occur as the result of local diseases, *e.g.*, hydrothorax in pleurisy, and ascites in liver fluke; or they may be associated with a general condition of debility as in the œdematous and anasarcal conditions of the trunk and limbs in low febrile condirions.

(To be continued.)

A NEW VEGETABLE PEST.

The Tomato Weevil.

(Desiantha novica, Lea.)

C. French, Junr., Assistant Government Entomologist.

During the last three months many specimens of a small greyish brown weevil (measuring about a quarter of an inch in length, with a V shaped marking on the wing cases and two projections, one on each of the wing cases) were sent in for identification to the Entomological Branch, the persons forwarding them stating that these weevils were destroying great numbers of tomato and other plants at Ascot Vale, Essendon, Preston, and other places, and they requested information regarding this new pest. The insects were unknown and specimens were forwarded to Mr. A. M. Lea, F.E.S., Government Entomologist, Tasmania (he being the leading authority on Curculionidæ or Weevils) for naming, and he replied that they were also unknown to him. Regarding the specimens as a new species of weevil he has now named it *Desiantha novica.*

These insects are simply in thousands in some gardens and destroy all kinds of vegetables. One grower informs me that he lost eighty tomato plants in a couple of nights, and that one evening alone he collected 638 weevils in the space of an hour, and in a week he estimates that he collected and destroyed some thousands. The insects conceal themselves in the soil and debris during the day, and at night come out to feed: they devour the whole plant very rapidly, and should they be disturbed or a light brought near them, they immediately drop to the ground and get out of sight as soon as possible.

The larva or caterpillar is small, of a pea green colour, and is found in the soil, usually a few inches below the surface, and when about to pupate or turn into the chrysalis it constructs a cocoon made of soil, where it remains for a couple of months, and then emerges as the perfect insect.

Remedies.

I placed some tomato plants sprayed with arsenate of lead in an observation box and liberated about 50 of the weevils. They immediately commenced to feed and were all dead in less than twenty-four hours. As the weevils are in the ground close to the plants during the day I would recommend that the soil be continually turned up and that fowls be placed in coops close to the plants. By these means alone the pest could be kept in check.

It would not be advisable to spray such vegetables as lettuce, cabbage, &c., with the arsenical spray, but if placing poultry as suggested above in the vegetable garden were carried out this would certainly be beneficial. Another plan that would capture numbers of the insects is to place a piece of newspaper under the plants at night, and take a lantern or any light out amongst the plants; when the insects see the light they will fall on the paper and can be gathered up and destroyed. All marsh mallow plants growing on vacant ground adjoining gardens should be destroyed, as the insects live on them and when all the marsh mallows are eaten they invade gardens and not only destroy vegetable but flower plants also, pansies in particular being a favourite food of theirs.

Growers are warned against the dangerous practice of spraying lettuces, tomatoes, and other such vegetables with poisonous sprays (arsenic, &c.), as the vegetables are frequently consumed before the poison has been washed off them. The plants may be sprayed in their early stages with safety, but when the fruit is nearly formed great care should be exercised in this matter.

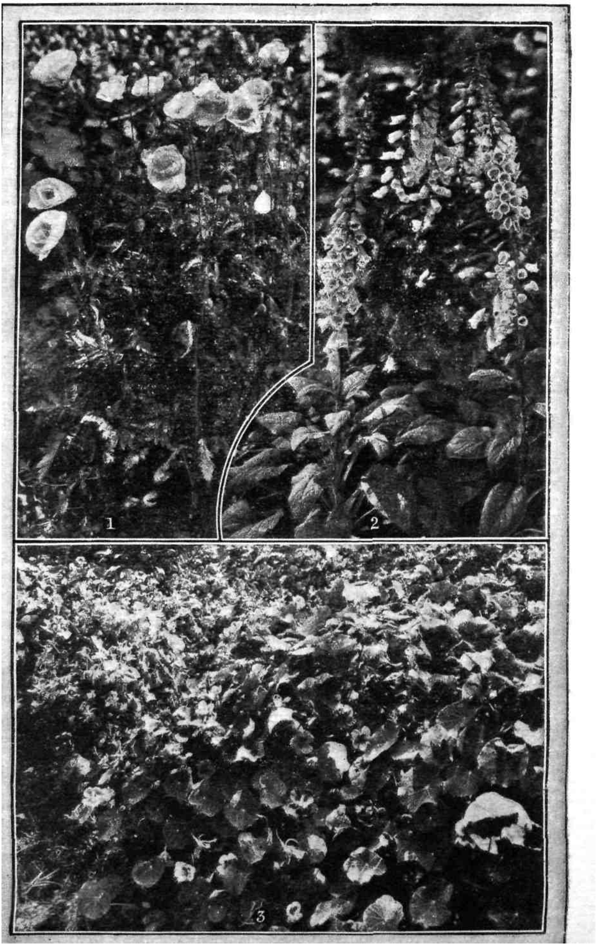
GARDEN NOTES.

J. Cronin, Principal, School of Horticulture, Burnley.

Annuals and Biennials.

Annuals are plants that develop from seeds, mature their growth, blossom, produce seeds, and die within one year. Biennials differ from annuals in that two years are required for the cycle from seeds sown to seeds saved from the resultant plants, the plants maturing their growth in the first year, and flowering, producing their seeds, and dying in the second.

A number of plants that are perennial in habit of growth are classed as annuals by gardeners, and treated as such on account of ease of culture, as well as increase of vigour, in the young seedling plant as compared with the growth produced by the perennial after a debilitating season of growth and bloom. It is much easier and more profitable to raise pansies, Iceland poppies, and other plants that are true perennials from seeds each season than to save them during a hot and dry summer. Annuals are classified as hardy or half hardy, according to their powers of resistance to frost and adverse weather conditions generally. Many kinds are native to tropical or semi-tropical regions and while they are damaged or destroyed by the ordinary winter conditions obtaining in the greater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There is a decided and merited increase latterly in the culture of many of the most popular annual and biennial plants, their presence in most gardens, when well grown, insuring a display of bright or sweetly perfumed flowers during the greater part of the warm season of the year, when the more permanent occupants are devoid of blooms. In response to the demand that has arisen for young plants for transplanting, nurserymen i various parts of the State have devoted considerable space and time to the raising of the most popular lines, and a trade in annuals, &c., has been built up in recent years that returns a large revenue to those engaged in it. This trade has been facilitated by the excellent parcel post arrangements, it being possible to obtain young plants, in fresh, vigorous, condition when properly packed, in any part of the State, from nurserymen located in the metropolis, or important provincial towns.

Raising Annuals, &c., from Seed.

Nurserymen and proficient gardeners experience very little difficulty in raising plants from good seeds, but the novice often fails on account of ignorance of the necessary conditions for their propagation. The first condition necessary towards success is good fresh seed, it being as reasonable to expect to get a chicken from an addled egg as a plant from a seed that has lost its germinating power through old age. Seeds require a moderate moisture and warmth to insure germination, and also comparative absence of light and presence of air in the soil. A well tilled and finely divided loam or a light sandy soil, fairly provided with humus, supplies the requisite conditions generally. Good drainage insures soil aeration, and the soil covering that is placed over the seeds, the necessary exclusion of light.

Many annual plants will not thrive if disturbed by transplanting, mignonette being an example. In such cases the seeds should be sown thinly in the garden beds; but the majority of kinds transplant well and it is generally most convenient to raise the plants in small beds, boxes, &c., and, when they are sufficiently large, to transfer them to their flowering quarters. A few shallow boxes and a small quantity of light porous soil is often the only equipment of some of the "small" trade growers, and it is astonishing what large quantities of plants are raised in such places during one year. The boxes are perforated and thoroughly drained by placing about two inches of coarse ashes over the bottom, then the soil is placed in them and pressed fairly firm. The surface is made smooth and even and the seeds sown evenly and thinly and covered with light sifted soil to a depth agreeing with the size of seeds. Very fine seeds should be merely covered, those moderate in size, which includes most flowering annuals as stocks, phlox, &c., to a depth of about half an inch, while larger seeds such as sweet peas, large sunflowers, &c., require to be covered by at least two inches of soil to insure sufficient moisture to soften the seeds and promote germination. The soil used should be damp, but not wet or sticky, to sow the seeds on, but the covering soil should be rather dry.

No manure is necessary to the germination of the seed or the welfare of the young plant until it is transplanted, and it is often on account of the use of organic manure or fertilisers in the seed beds that failure has resulted. More sturdy and hardy plants are raised when the soil is comparatively poor and dry. The roots of such plants are more fibrous in character than those of plants grown in rich soil and liberally watered, and can be transplanted with a good prospect of success, if the soil that they

are transplanted in is in good condition and supplied with plant food. Watering seed beds is also a frequent cause of failure. If the soil is moderately moist, little, if any, water is required until the plants appear, and in case of palpable need of water it should be applied gently through a fine rose nozzle. A heavy, splashing, watering will produce a caked surface through which the young tender plant cannot penetrate.

Soil Preparation and Planting.

The secret of the cultivation of the fine flowers seen at exhibitions is a thorough preparation of the soil. It is commonly the fate of annuals to be planted in poor, cloddy, soil that has been robbed by large shrubs or trees of all moisture and plant food it contained. Under such conditions poor results are certain, but if a position is selected free from root invasion and in good sunlight, and the soil is deeply worked and well manured, and afterwards cultivated and watered when necessary, strong plants and fine flowers will develop if the variety is a good one and suitable to the place.

A succession of plantings of various annuals may be made while moderately moist conditions prevail in spring, the best results being obtained from plants that have been set out fairly early while the soil and the air were moist and the weather cool. The plants should not be allowed to grow in the seed beds or boxes until they are drawn and weakly, but should be transplanted when about an inch or slightly more in height, if the kind is capable of resisting the climatic influences likely to occur. Sufficient room should be allowed for each plant to enable it to attain its maximum size. A very common error is to plant closely to "cover the ground" quickly. The plants consequently are starved and, if such is the cultivator's ideal, it would be waste to purchase seeds or plants of good kinds or varieties. To prolong the season of blooming, the flowers of free seeding annual plants should be cut as soon as they are fading, thus preventing the formation of seeds which would quickly terminate the flowering period if permitted.

Selection of Kinds.

Individual taste and local conditions generally determine the choice of all plants. In the case of annuals and biennials, the cultivator has a wide range of plants and seeds to choose from and should be guided in a great measure by results obtained locally. Among the most valuable and popular annuals are :—Sweet peas, phlox Drummondii, cornflowers, poppies, larkspurs, coreopsis, mignonette, lupins, sweet sultan, sunflowers, nasturtiums, stocks, nemesias, asters, zinnias, salpiglossis, cockscombs, amaranthus, Sturt's desert pea, various everlasting flowers, and annual grasses. Biennial plants worthy of culture include :—Foxgloves, Canterbury bells, wallflowers, stocks of the Brompton class, leptosyne, &c.

Flower Garden.

As the foliage of daffodils and other spring flowering bulbous plants dies the bulbs should be lifted, if such is the intention. After being cleaned, the bulbs should be stored away in a cool dry place until planting season. If the bulbs are to be replanted in the same situation, the soil should be thoroughly broken up, and new soil added and well worked in. A dressing of bonedust may be incorporated with benefit.

Dahlias intended for the culture of exhibition blooms should be planted during December. In the metropolitan district, from the middle until the end of the month is found most suitable for planting green plants from pots. When planted at that time the blooms are produced from mid-March until the cold weather arrives. Care should be taken that no plants harbouring red spider should be permitted to grow near dahlias. In such case the dahlias are sure to be attacked and in normal summer weather it is a most difficult matter to eradicate the pest.

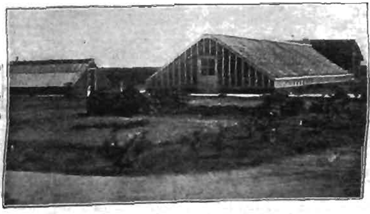
Chrysanthemums will require to be thinned to a few shoots where large blooms are desired, and the selected shoots tied to stakes. From four to six shoots may be allowed to each strong plant growing in the open ground, while three are sufficient if the plants are weakly. In hot dry positions, a mulching of cool stable manure will materially assist the plants to develop strong sturdy growths. Newly planted roses should not be allowed to suffer from drought. A thorough watering, followed by surface cultivation when the soil is drying and the application of a mulch of manure immediately, will afford the plants sufficient moisture for several weeks.

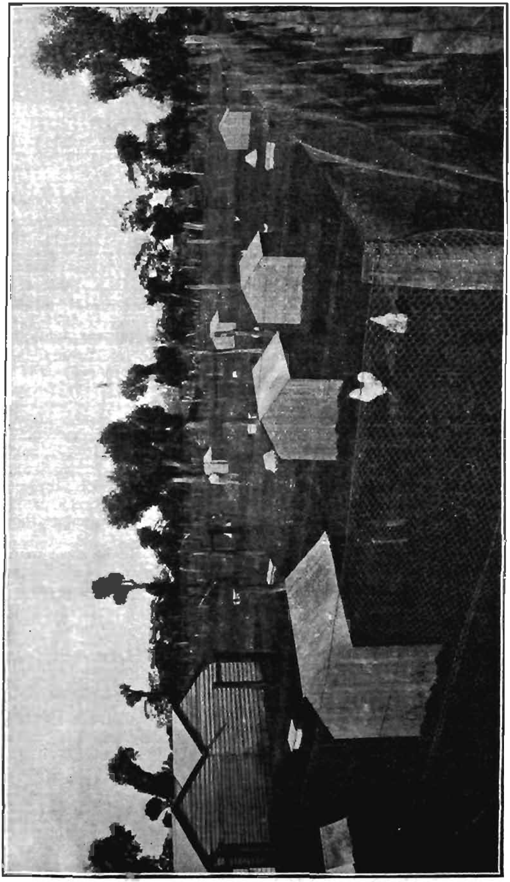
The latest batch of gladioli should be planted about the middle of the month. The plants will bloom after the heat of summer is over and make a good display during the autumn. A liberal dressing of stable manure, well worked into the soil about eighteen inches below the surface, is most beneficial to gladioli, but no manure should come into actual contact with the corms.

Kitchen Garden.

Lateral growths should be removed from tomatoes as they develop. The leading growths should be tied to stakes and, when the fruit is setting freely, water should be applied liberally if the weather is dry and warm. Where the larvæ of the tomato moth are noticed to be attacking the young fruit the plants should be thoroughly sprayed with Paris Green or other arsenical wash. Application of spray washes of a poisonous nature should not be applied after the fruit is about half developed.

Seeds of French beans and various saladings should be sown to provide a succession. The surface should be stirred frequently to conserve moisture and prevent weeds from growing. Young crops must be thoroughly watered as the need arises.





FIRST PRIZE. MR. R. DICKSON'S POULTRY FARM, BACCHUS MARSH.

BACCHUS MARSH POULTRY FARM COMPETITION.

REPORT AND AWARDS.

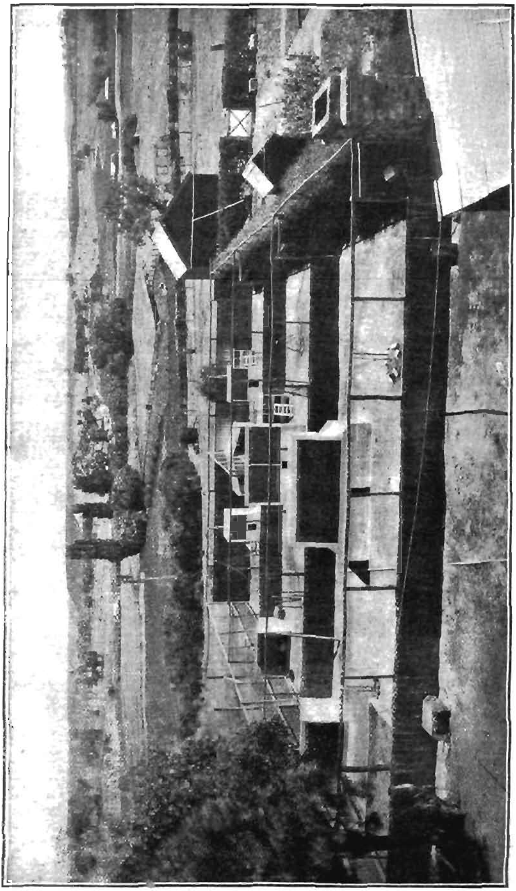
H. V. Hawkins, Poultry Expert.

In 1902 the first practical step was taken by the Department of Agriculture to deliver a series of lectures on agricultural topics to the farming community of Bacchus Marsh. The lectures and demonstrations extended over 30 days and an average attendance of over 50 was maintained. Amongst the subjects dealt with was that of Poultry Breeding and Management. As a result of the success which attended this and subsequent efforts and to still further develop the interest in poultry culture, two special prizes were recently offered by the President and the Committee of the Bacchus Marsh Agricultural and Pastoral Society. The competition was limited to farmers residing within a radius of 20 miles of the local show grounds. Whilst judging, I was accompanied by the President, Capt. Billinghurst.

The first farm visited was that of Mr. Robert Alkemade of Coimadai, 7 miles from Bacchus Marsh. This farm, which occupies about 1½ acres on a south-westerly slope, is well sheltered and neatly laid out with 4 pens of 50 x 20 feet each. The divisions are made of 3 x 2 hardwood posts, 6 feet high, with three battens of 3 x 1 hardwood—bottom, centre and on top. The lower portion is closed with 3-feet palings, with an equal width of wire mesh on top, attached to the centre and top battens. It is well to point out here that a top rail is not necessary or advisable as it encourages the birds to fly on to it, causing serious losses during the breeding season.

The houses, which are portable, are well constructed, have verminproof perches, are scrupulously clean and are white washed throughout but lack that uniformity of design which appeals to the critical eye. This is especially noticeable in the first pen. The house in the centre of the second pen is much better. Five feet distant from it will be observed a well designed egg house, raised 18 inches from the ground and divided into three partitions—dark and inviting to the conservative hen. Exposed egg boxes encourage the bad habit of egg-eating—the more secluded the nest, the more the hen will be satisfied and few will be found to indulge in the habit. Although the pens lack uniformity, full credit must be given to Mr. Alkemade for the many excellent improvements devised by him.

The water vessel in use consists of a shallow square tin placed inside of a brick covered frame at the back of which is a ventilator, permitting a cool current of air to pass over the water. Thus, in all weathers, the drinking water is kept shaded and cool. The pens are provided with ample supplies of grit, shell and charcoal, suspended in a divided hopper neatly cut out of kerosene tins. During the heat of mid-summer the yards are sprayed. An illustration of this was given at the time of our visit, and it was surprising how soon the birds took advantage of the cool spray bath. The ground being loamy, they set to work with feet and wings to cool and cleanse their bodies. Spraying may, with advantage, be adopted at most of the poultry farms throughout the State as the hen flea (*Menopon pallidum*) works havoc if not checked. In the corner of each pen is a square of 10 x 10 for scratching purposes. It contains



SECOND PRIZE. MR. R. ALKEMADE'S POULTRY FARM, COIMADAI.

dry litter and it is here that the birds have to work for their food. In the other corner is seen a neat house in which sand and ashes are placed—this is the winter dust bath.

The breeds kept consist of Silver and White Wyandottes and Black Minorcas—all useful birds for utility purposes. They are a nice, even lot of good type and fair colour and are healthy and vigorous. During the spring and summer, access is occasionally given to a strip of lucerne which, being irrigated, provides the necessary green fodder.

To sum up Mr. Alkemade's farm. It is an ideal spot, is easy to drain, is replete with almost every detail, is scrupulously clean, everything is in its place (except in the first pen), and the houses and utensils are well made. Above all, Mr. and Mrs. Alkemade are enthusiasts. The area is scarcely large enough to accommodate sufficient fowls to carry on poultry farming as a distinct calling. I understand that with the owner it is more of a hobby than a business concern; at the same time, great credit is due to him and the farm is worthy of a visit from those interested in poultry culture. It is admitted that many keep poultry as a hobby, but what better tonic can a man or woman have than the care of farm animals? To the housewife, it breaks the monotony of indoor life; to the children, it fosters a feeling of love and sympathy, and makes men and women of them. Would that the average farmer encouraged his boys and girls to make home life more acceptable by Aviculture or floriculture.

Returning from Coimadai, and close to Bacchus Marsh, we drew up at Mr. Casper's homestead which would not be classed with the one already described, although the methods adopted are somewhat new. The pens are made on the hurdle principle, with neat portable houses which are easily moved on sledge skids. The space occupied by each pen is 20 x 20. It is wired in top and bottom and as there are 16 birds kept in each enclosure little or no food is picked up, so they are fed twice daily. With 50 birds of a first class laying strain of Brown and White Leghorns, a profit of 40 per cent. on the food cost is being made. Adjoining the farm is half an acre under crop which will be a great saving should feed remain at present prices.

Mr. Casper has commenced well. His system is a good one, permitting the birds to have a change of ground. Tainted soil usually results in trouble, and this is obviated on the farm in question.

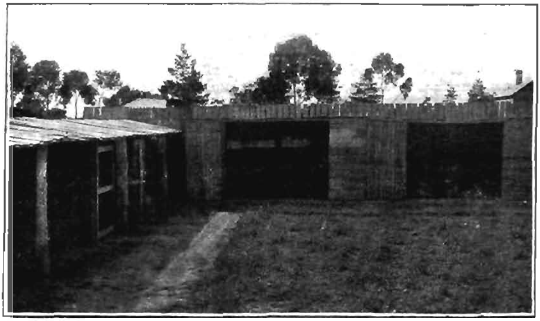
On the outskirts of the town, Mr. E. E. Palmer occupies a small area. The accommodation is as yet very primitive; in fact, not fit to be considered with the others, save for the fine specimens of Black and Buff Orpingtons and old English Game found there. The latter are of fair size and in good condition. Although only fair layers, they make large plump-breasted table fowls, especially when crossed with Dorking or Buff Orpington hens. It is understood that Mr. Palmer intends remodelling his yards. If so, it will be distinctly advantageous to remove the large shed, otherwise vermin will be troublesome for years to come. Large buildings are not required—small flocks and small houses (well ventilated and facing the east) are requisites when poultry farming. The more cumbersome the house, the greater the difficulties.

To the south-west, in beautiful undulating country and surrounded by huge gums, is the farm of Mr. Robert Dickson. It is a pretty farm, greatly in advance of most of those in the competition. Mr. Dickson farms poultry for profit and he has succeeded admirably, by a wise selection of site—gentle easterly slope with well laid out pens of 70 x 30 each. Uniformity has been his watchword and the result is excellent. A feature

in laying out pens is the avoidance of unnecessary labour in opening two gates where one is practicable. This has not been overlooked by Mr. Dickson.

The birds are an even lot, consisting of White and Brown Leghorns, Barred Plymouth Rocks and White Wyandottes, from which 85 dozen eggs weekly have been repeatedly marketed. Mr. Dickson is a believer in the early pullet—hence the dear egg is the one that pays him best. Cool storage is provided so that eggs may be kept for a period when prices are low. Adjoining the pens (7), are several plots of 3 acres each under maize, oats, rape and barley.

The incubating room is cool and well laid out and is white washed throughout. It will accommodate 50 hens during the breeding season. Mr. Dickson prefers the Plymouth Rock to the incubator and he has little difficulty in getting broody hens early in each year, as, in hatching early chicks, he is always sure of early brooders. At the same time, it must not be overlooked that artificial incubation is the most economical and, where large flocks are required, it is an absolute necessity. A farm is not complete without poultry, neither is a poultry farm complete without artificial means of incubation. This is a progressive age—we must advance with the times and incubators will help us.



WINTER SCRATCHING PENS FOR EGG PRODUCTION.
(Poultry Farm of Mr. J. Liersch, Werribee.)

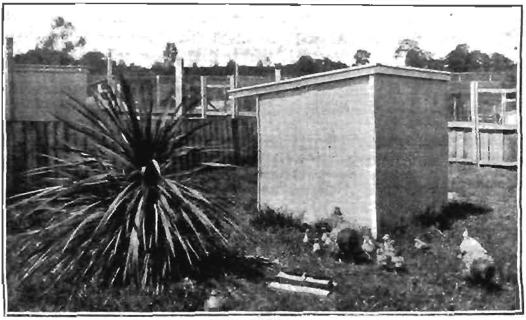
The breeding of ferrets is a unique feature on this farm. I saw 22 young ones and Mr. Dickson states that there is a good demand for them at payable prices. He also utilizes the ferrets when rabbiting. The rabbit is the only animal food his birds receive. Last year the rabbit skins sold realized £6; so in this case, at all events, bunny is worth more than he is usually given credit for.

Another farm visited was that of Mr. J. Lodge, well known as an exhibitor of Minorcas and Black Orpingtons. He has an area of 5½ acres which is an object lesson in intense culture. Not only poultry, but 21 hives of bees are kept, yielding 150 lbs. of honey every alternate year. Vines produce ½ ton of grapes each season. There are also roses of the choicest kinds, Jonathan apple trees, gooseberries, lucerne, onions, lettuce, beans and peas—all free from pests. This farm was a revelation to me of

what it is possible for a a man to do on a small block by intense cultivation. Space does not admit of an exhaustive account of his poultry pens. Suffice it to say that they are well catered for, good houses, cleanliness, and shade being in evidence, but lacking in uniformity.

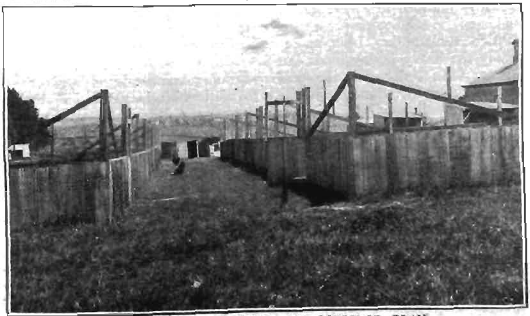
SUMMARY AND AWARDS.

Viewing the whole competition from a practical stand-point, there are several matters which call for favourable comment. First, the



AN IDEAL BREEDING PEN.

friendly manner in which the competition was carried out; second, the spirit of emulation amongst most of the competitors, particularly so with regard to the breeds kept, *i.e.*, utility first, show birds, second; third, the attention paid by all to detail; fourth, the fact that the competition will add a stimulus to the industry.



ARRANGEMENT OF YARDS ON CORRIDOR PLAN.

In making the awards, I have carefully refrained from allotting too many points to exhibition birds; due regard has, however, been given to

locality, arrangement of pens, suitability of breeds (either for export or egg production), cleanliness, uniformity, attention to detail, and the practicability of making the farm a going concern.

The points allotted to the various competitors are as follow:—

Order of Merit.	Name.	Address.	Points Awarded.
1	R. Dickson	Bacchus Marsh	90
2	R. Alkemade	Coimadai	85
3	J. Lodge	Bacchus Marsh	81
4	J. Liersch	Werribee	77
5	E. Casper	Bacchus Marsh	75
6	E. E. Palmer	Bacchus Marsh	60

The illustrations give a good idea of the leading farms and, with a view to creating further interest in this and other districts, I have taken the liberty of including views of my own pens as a guide to those desirous of equipping their farms with up to date pens, and so make the breeding of poultry more profitable and their care more congenial.

In conclusion, I desire to place on record my keen appreciation of the kindly assistance rendered during the competition by the President (Capt. Billinghurst) and the Secretary (Mr. Johns).

THE "NEW SYSTEM" OF SELECTING LAYING HENS.

To the Editor of the *Journal*.

Sir,—For several years prior to entering upon his present work the writer was closely connected with the poultry industry, and during that time carried out extensive experiments in hatching, feeding, and the general management of all classes of poultry utilized for egg-production and table purposes.

The variations observed in the condition of laying hens during the course of these investigations, and the conclusions arrived at in connexion therewith would, at this juncture, appear to be of special interest. In the columns of the Melbourne press there have recently appeared advertisements in which a claim has been made regarding the discovery of a system whereby the heavy laying birds can unfailingly be picked from any flock of hens. In order that the poultry-farming community of this State may not suffer loss through inability to distinguish between the possible and impossible in connexion with such systems the following explanation of the principles involved is here set out.

The skin of most animals when they are in good condition is soft and pliable to the touch. This also applies to domestic poultry. In hens, this elasticity is most noticeable in the hinder part of the body from the legs to the vent, and especially when they are in full laying. If a bird has been out of condition for any length of time, or even when over-fat, this pliability of the skin is gradually reduced; and a certain coarseness, dryness, or firmness of the skin is then apparent. There is also a corresponding expansion and contraction of the pubic bones of the pelvis noticeable at this part of the body according to the laying or non-laying condition of the fowl; and on this fact is based the so-called discovery of these several systems. When it is understood that laying almost wholly depends on condition, the fallacy of any such system of picking heavy layers is apparent.

No matter what width the pelvic bones may be apart, if a hen is over-fat she will not be a heavy layer; and any reduction in flesh below normal laying condition that has a tendency to interfere with the vitality of the bird will both check her laying, and cause a speedy contraction of the abdominal parts mentioned. However, when once a correct knowledge of the application has been acquired, this combination of fair condition, wide pelvic bones, and pliability of the skin beneath the fluff, will prove a sure guide as to whether the bird handled is laying at that particular time. If hens are carefully looked over at stated intervals, and those found to be not laying are removed, the drones of the flock will soon disappear; for they cannot possibly escape detection.

In a disputation that appeared in the *Petaluma Poultry Journal* in 1906, Mr. Hogan—one of the originators of these "systems"—is credited with the acknowledgment that the physical conformation of a hen may change according to her condition as much as 25 per cent. One of his customers, however, mentions cases where the alteration has been equal to 300 per cent.; and also refers to a "Hoganized" 380 egg hen that went so much "off" in condition that she showed equal only to about 30 eggs per year. This statement is quite in accordance with the writer's observations; and hens that have been proved exceptionally heavy layers by the use of the trap nest do not, in many cases, support their known exceptioned egg-producing capacity by their structural formation at the time of handling.

When lifting a hen to examine her condition the most handy way to take hold of her is by placing the hand on her "shoulders" from the front: and, slipping the thumb under one wing, and the fingers under the other, to grasp them at the butts firmly but gently; the hen can then be handled without any fuss. Then, by placing the other hand on the fluff or rear part of the bird's body from the underneath side, or by slightly turning her over, with the tips of the fingers the two pelvic bones which lie one on each side below and adjacent to the vent can be located. Almost invariably in a low conditioned bird the points of these bones stand clearly defined to the touch. As the bird makes flesh they gradually become covered; till, in an over-fat bird, there is some slight difficulty in exactly locating them on account of the thickness of the overlying tissue. The structure of fowls varies greatly in its formation at this part, some birds having a much larger space between the pelvic bones than others, even as chickens; and others, when matured, having the points of these bones not more than ½ inch apart; others, again, will have them at various widths, even up to 2 inches. To a practical poultryman who understands feeding for condition, and who consequently is well versed in the handling of fowls, the position of these bones, when taken with the bird's general condition, is a tolerably good guide as to whether she is laying or not. He can also determine how long it would take to put a particular bird into laying condition if necessary. When from any cause whatever the bird is not laying, there is almost immediately a drawing together and tightening of the skin, and a closing towards each other of the points of the pelvic bones. There is also a corresponding relaxation in those parts as laying approaches. As size, age, and breed, all to some extent control the structure of each bird, the actual width between the pelvic bones cannot by itself be taken as positively demonstrating the laying condition of any hen. Speaking generally, the bird that is fairly wide between these bones may be looked upon as a good layer; just as one that is wide and deep in the fluff when viewed from the rear is likewise usually considered. The condition of

the bird can only be ascertained by handling; and without the knowledge of her condition as drawn from the actual touch, no external appearance of a hen will correctly indicate whether she is laying or not.

The want of a simple method of culling out the non-layers from an ordinarily well bred and well-cared for flock has been the cause of much annual loss to poultrymen. Trap-nests have done much towards culling out these drones; but these contrivances are not suitable for the practical working of an ordinary farm flock. The periodical handling of the fowls is a much simpler, and almost as effective a method; and for general egg-farming nothing more is needed.

Every hen-house should be built and fitted to permit of the stock being easily handled at night-time. Poultry are usually averse to being interfered with in any way in daylight; but they can be looked over at night with little trouble with the aid of a lamp; and it is policy to accustom them to being so dealt with while they are chickens. In this connexion it is essential that their roosting houses be so constructed that they can be closed at any time; that the roosts be all on the one level, and not more than 3 feet from the ground; and that the houses are kept clean and free from vermin; all of which are in accordance with the requirements of practical chicken raising. Fowls generally moult during the late summer or autumn months; and while they are growing their fresh coat of feathers egg-production usually ceases. Moulting occupies from six to eight weeks; and, unless she is hatching or raising chickens, a hen should be engaged in laying throughout the rest of the year. Many hens will take an occasional rest for a week or so after a long spell of laying; and, unless those rests are prolonged to the possible detriment of the total egg-yield, no notice need be taken of them; but the hen that does not do something towards paying for her board during any four consecutive weeks—excepting when she is moulting—should be removed from the flock; and either fed to promote laying, or be sold for what she will bring. On the farm, the latter course will be found the most satisfactory way of dealing with non-layers, unless the price obtainable is below their value as table fowls for home use, or the quantity to be disposed of is too large to be thus dealt with.

This systematic handling of the flock will be found very useful in many ways. The presence of vermin in the sheds will soon become detected, and their destruction will allow the birds to thrive better. The result of any change of feed, or the necessity for a change, can also easily be noted. Incipient cases of sickness have also better chances of being discovered by such inspections, and with prompt treatment losses may be prevented. The non-productive hens should be regularly culled from every flock. By careful observation along the above lines their discovery is easy; and with their removal poultry-farming speedily becomes more profitable.

Yours, etc.,

J. S. McFADZEAN,

Dairy Supervisor.

The Index of Vol. VI. will be supplied with the first number of Vol. VII., viz.:— 11th January, 1909.

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